BIZ2BIS: a socio-technical approach to design inter-organizational business models and their underlying information systems

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“The importance of the lopsided, the thing that’s skewed a little. You were looking for balance, beautiful balance, equal parts, equal sides. I know this. I know you. But you should have been tracking the yen in its tics and quirks. The little quirk. The misshape.”

Don Delillo in Cosmopolis

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Abstract

Information and communication technologies (ICTs), especially the Internet, have been gradually changing the playing field for organizations. The unparalleled connectivity achieved at minor costs altered the balance between transaction and coordination expenditures as well as the social, commercial, and geographical boundaries between companies. Inter-organizational networks flourished and their participants were given the chance to define new processes with different business rules and innovative value propositions. In these new and complex settings, organizations can cooperate and share goals while competing for a particular advantage. They can also leverage resources and intelligence to generate solutions that no firm alone would be able to achieve.

Inter-organizational business models are frequently decentralized environments, without a single point of authority for decision-making or a hierarchy mandated to assign roles to the stakeholders. These can share interests but can also possess different and conflicting expectations. Moreover, the interconnected nature of inter-organizational networks makes it difficult to identify their boundaries and handle their dynamics. To maintain stability in the long run, the networked business model must be able to provide attractive and balanced value propositions for all those involved. Due to the difficulty in satisfying individual expectations and simultaneously promote the network goals, there is a need for guidelines to assist in designing and tuning the right business model.

We developed a new approach, called BIZ2BIS (from Business Models to the Blueprint of the Information System) to discuss, design, and evaluate inter-organizational business models and derive high-level requirements for the underlying information system. It consists of an iterative and incremental process that involves the various stakeholders in seeking a set of value propositions that ensure that the various elements are willing to participate in a sustained manner. To conceive BIZ2BIS, we started with an exhaustive literature review on business models, which disclosed key topics and underlined the importance of their socio-technical nature. To address this dimension, we grounded our approach on the tenets of Actor-Network Theory (ANT). The approach also uses insights obtained from the study of business models to systematically identify the high-level requirements of their underlying information system in a business model driven way. We used the first draft of BIZ2BIS and two of its updated versions to analyze our three case studies: HowMuchIsIt, publishing an online journal, and GreenHomes. This allowed us to weed out potential preliminary problems and progressively enhance the approach maturity. In our last case, InovWine, we had the chance to act on its scenario. Action research guided BIZ2BIS application and our intervention.

The process and instruments proposed in BIZ2BIS enable the systematic reasoning about inter-organizational business models, thus facilitating the discovery of potential dependencies, problems, and solutions to better the chances of getting the sustained commitment of the parties in these complex settings. It also provides an initial blueprint of the supporting information system.

Resumo

A evolução protagonizada pelas Tecnologias de Informação e Comunicação, em particular a Internet, tem alterado gradualmente a forma como as organizações operam e interagem. O fenómeno da comunicação em rede atingiu níveis sem precedentes, com custos de suporte comportáveis para a generalidade das instituições e dos cidadãos, o que alterou o equilíbrio entre as despesas de transacção e coordenação, assim como as fronteiras geográficas, sociais e comerciais. Proliferam redes inter-organizacionais que possibilitaram a definição de novos processos, com regras de negócio e propostas de valor inovadoras. Neste contexto, as organizações têm a possibilidade de explorar formas de cooperação que lhes sejam vantajosas.

Os modelos de negócio inter-organizacionais são usualmente ambientes descentralizados desprovidos de um único ponto de controlo ou de uma hierarquia bem definida à qual seja reconhecida a capacidade de coordenar e atribuir papéis. Se por um lado as entidades envolvidas podem partilhar interesses, por outro podem possuir expectativas antagónicas. A complexidade das relações existentes cria ainda dificuldades adicionais à identificação dos limites da rede criada, ao papel de cada um dos seus elementos, à forma como interagem e à percepção da dinâmica da rede. Para manter a sua estabilidade a longo prazo, os modelos de negócio devem ser capazes de proporcionar propostas de valor atractivas, que fomentem o alinhamento dos diferentes interesses coexistentes e que promovam a participação de todos os envolvidos. A dificuldade em conciliar interesses individuais com os objectivos da rede enfatiza ainda a relevância de propor orientações para o desenho e refinamento do modelo de negócio.

Nós desenvolvemos uma nova abordagem, denominada de BIZ2BIS (from Business Models to the Blueprint of the Information System) que possibilita a discussão, desenho e avaliação de modelos de negócio inter-organizacionais, bem como a identificação dos requisitos de alto nível dos seus sistemas de informação de suporte. Consiste num processo incremental que envolve os elementos da rede na procura de um conjunto de propostas de valor que os motive a participar na solução adoptada. A proposta teve como base uma revisão detalhada da literatura em modelos de negócio, o que nos permitiu identificar tópicos a abordar e detectar a importância de considerar a sua natureza sócio-técnica. Para abordar esta dimensão, inspirámo-nos nos princípios da Actor-Network Theory (ANT). A BIZ2BIS também utiliza contribuições obtidas a partir de modelos de negócio a que recorremos como casos. A sua primeira versão e duas posteriores actualizações foram utilizadas para analisar três estudos de caso: HowMuchIsIt, revista online e GreenHomes, o que nos permitiu, numa fase preliminar, eliminar potenciais problemas e progressivamente contribuir para a maturidade da abordagem. No quarto caso, InovWine, as nossas sugestões resultaram em alterações à forma como o modelo de negócio estava a ser concebido. A investigação-acção orientou o uso da BIZ2BIS e a nossa intervenção.

O processo e os instrumentos propostos possibilitam o estudo sistemático de modelos de negócio inter-organizacionais, facilitando assim a descoberta de dependências, problemas e soluções que promovam o envolvimento sustentado das partes envolvidas. Este conhecimento é utilizado pela abordagem para especificar os requisitos de alto nível dos sistemas de informação de suporte.

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Chapter 1

Introduction

In this chapter, we introduce the thesis by presenting its problem space. Then, we briefly describe the theoretical perspectives that influenced our work, in particular inputs from the business model domain and Actor-Network Theory. Next, we present the formulated research purpose and questions, as well as the strategy adopted in the attempt to answer them. Finally, we discuss its contributions and outline the thesis structure.

1.1 Problem statement

In the course of history, technology has enabled innovative business opportunities through incremental or radical innovation (Schumpeter, 1934, p. 11). This also holds true in the Internet era. The progress in the information and communications technologies (ICTs) has afforded radical changes in communication formats (Tapscott et al., 2000) and on how information has been handled (accessed, manipulated, transmitted, and stored). The advances made reshaped economic relationships, organizational structures, and enterprise processes. Ever since the first online business model started to offer their services, in the mid 1990s, the way of doing business has never been quite the same (Turban et al., 2002).

Technological advances cleared away geographical, physical, and temporal restrictions and changed companies and customers social, commercial, and geographical bounds. It became possible to buy products without leaving home, 24 hours a day, seven days a week, from companies anywhere around the globe, cutting out middlemen. New communication and distribution channels brought companies and their customers closer than ever before. Intermediary businesses and information brokers were circumvented and the guiding logic behind some established industries began to fall apart (Amit and Zott, 2001). ICTs changed the rules of making business and caught traditional enterprises off guard. For instance, the Encyclopædia Britannica, that relied on sales of hard cover books, almost disappeared when online alternatives like Wikipedia and Encarta were made available for free or at lower prices (Hales, 2005). In March 2012, the company decided to focus on its online version and announced it would no longer publish its printed editions.

ICTs paved the way for new businesses and powered the dot-com bubble, which is usually defined as the period of investment and speculation in Internet firms from roughly 1995 to 2001.

This period was marked by the founding of a group of new Internet-based companies, commonly referred to as dot-coms. The investors answered with enthusiasm to their appeal and a combination of rapidly increasing stock prices, individual speculation, and widely available venture capital created massive expectations (Gray et al., 2007).

In the dot-com bubble, these new ventures gathered the support of many people that believed in the potential of those companies to transform the business landscape, for instance Wood (2000). At the time, investors were convinced to participate in earlier stages of a business enterprise and the company's business models were invoked to give some legitimacy to what remained as an unproven idea (Magreta, 2002). During this phase, most companies undertook unusual and daring business practices to explore the new opportunities. Most neglected clients' value propositions and engaged in a policy of growth over profit (Gordjin, 2002). They assumed that if they built up their customer base, their revenues would rise as well. However, many of them were not able to render their ideas lucrative and serious corrections took place causing the stock market to tumble. In the year 2000, the NASDAQ collapsed and many dot-coms demised (Fox, 2000). This event was designated by the dotcom bubble burst and made it clear that a number of these business initiatives were unsuccessful (Shama, 2001, Vickers, 2000).

In spite of a scenario of desolation, panic, bankruptcies, and discredit in the post-dot-com era, the advantages of using ICTs were, and are, undeniable. Their wide dissemination and implementation reinforced their economic and social impact. A 2001 report from the OECD attests their contribution to the development of several countries in various fields: providing the necessary conditions to create innovative business configurations, supporting business interactions, increasing the quality of the services provided, fostering collaborations, and promoting employment (OECD, 2001).

The relationship between technological evolution and business model is readily seen in the ever-changing stock prices of Amazon. We can see how they rose from the initial 18 dollars to around 100 dollars in 1999. The impact of the bubble burst plummeted their value back to 18 dollars during 2000. Then, in the summer of 2001, it collapsed even further to 8 dollars (Harford, 2006). Signs of recovery were evident when the relation between business models and technology became more mature. For instance, in November 2002 their value was 19.5 dollars and in November 2003 was 55 dollars. In November 2012 their value achieved 226 dollars (Yahoo! Finance, 2012). The irrefutable role and acceptance of ICTs in today's world demands that countries and companies have a continuous capacity to empower them. For instance, the rise of successful user-generated content sites like Facebook and YouTube shows the vitality of field and the continuous possibilities of exploring new businesses.

The unprecedented ubiquitous connectivity achieved at negligible costs reduced coordination and transaction costs among firms (Heck and Vervest, 2007). With the use of the Internet as a business platform, firms are more properly viewed as connected to each other in multiple networks (Gulati et al., 2000). They were given the chance to open their boundaries, to establish complex and diversified business settings, access new markets, and define innovative processes with different business rules and original value propositions. They aimed at maximizing resources and intelligence to generate innovative solutions, in order to reach common goals that a firm alone would not be able to achieve (Svendsen and Laberge, 2005, Gulati et al., 2000). Several organizations can work together to address a complex shared cross-boundary problem, issue or opportunity and forge collaborations to jointly create value and offer more complex services. They can promote shared interests, offer joint value propositions, split revenue streams, minimize costs, or build-up common distribution networks.

The connections in inter-organizational networks can be of different types (e.g., collaboration, partnership, or competition) and cover diverse topics (e.g., money, data, services, knowledge, reputation, or prestige) (Ballejos and Montagna, 2008). In addition to the rich variety of links, the presence of several stakeholders introduces an extra complexity in the study of the business models. Their profile can be extremely diverse. They can originate from different areas, possess their own interests and sensibilities (each with their own business logic), as well as opposing positions that can lead to scenarios of competition. The possibility of eminent conflicts makes it difficult to ensure the sustained interest of the involved parties and the stability of the bonds, which can threaten the stability of the network of business partners and cause its collapse. Furthermore, the lack of formal authority of any one participant over its peers also gives rise to complex interdependencies that increase the difficulties in establishing network coordinating mechanisms and the network boundaries (Harrigan, 1987).

In the last years, researchers like Gordjin (2002) and Osterwalder (2004) proposed approaches that detail business model descriptions and avoid past mistakes in their conceptualization. Nonetheless, the work developed neglects the environmental complexity of networks and the specificities of the context of each element. It does not manage the contributions and returns for the participating organizations in order to ensure that all end up with attractive value propositions that regard their individual interests. Moreover, the proposals available do not provide guidelines to scrutinize and tune the delicate network balance. Individual analyses do not work when the success of a company depends on the collective satisfaction of all the other elements of the network (Iansiti and Levin, 2004). The complexity and highly dynamic nature of inter-organizational business models requires new forms of analysis capable of describing in detail the richness and potential of the forged networks. It is necessary, and urgent, to develop new paradigms and approaches to investigate and explore the potentialities offered by the network concept and facilitate co-working between its various elements, thus promoting robustness. In this research, we focused our analysis on inter-organizational networks.

As exposed, technology is one of the pillars of business model innovation. In turn, the constraints of a business model shape their technological support and exert a strong influence in the specification of the underlying information system. In spite of the attention devoted to the business model field by academics and practitioners, the exploration of connection points between business models and information systems is underrepresented in the literature (Bouwman et al., 2012). Addressing their dependencies is a challenge that goes beyond the sum of the parts (a business or an information system problem). Clear advantages can be obtained when specifying and conceptualizing business models by establishing connections points and detecting influences between both domains (Chan and Reich, 2007). However, the understanding of the dependencies between both fields is often hindered by the difficulty in describing networked business models in detail. Vague business ideas can hide inconsistencies and lead to false assumptions. This lack of information and imprecision can compromise the elicitation of business constraints that ultimately should be met in an early requirement phase by the information system supporting the business model (Gordjin, 2002). Therefore, in addition to the need to address and detail networked business model particularities, it is also crucial to create a new direction of research able to expose the connections between both domains and explore their synergies.

1.2 Background literature

Several schools of thought aided us in comprehending the problems at hand and pointed us towards a path of research. In this section, we discuss inspiring and relevant insights that grounded our investigation as well as identified gaps.

The conducted literature review helped us obtain the theoretical underpinnings that started to mold our answer to the needs identified in the previous section. We started by focusing our attention on the business model field (Chapter 2), which is characterized by some lack of consensus and diversified viewpoints. The youth of the field, the amount of different perspectives available, and the diversified origins of the research areas of business model investigators have contributed to explain the existing fuzziness (Zott et al., 2011). Through an exhaustive analysis of the available literature, Pateli and Giaglis (2004) perceived there was a lack of theoretical tools to organize the research in the field and proposed an analytical framework. We used it to outline our work and systematize the information already analyzed in the following sub-domains of business model research: definitions, components, taxonomies, representation models, evaluation, and adoption factors. The performed survey on the first three of these domains enabled us the identification of concepts that stood out regularly. For instance, value propositions, business organization, established partnerships, existing relationships, exchanged items, business participants, financial issues, performed activities, available resources, or distribution channels. Next, we analyzed available business model representations. In most of the cases their graphical notations were not very elaborated. In spite of the noted limitations, the addressed topics allowed us to confirm the relevance of the already identified concepts and to detect an additional effort in detailing the type of flows exchanged among the business participants (e.g. financial, information, goods and services, and intangibles).

The literature review also disclosed trends and open research questions. In the few cases where the assessment of the business models was discussed, we became aware that it was mainly confined to financial aspects. However, other types of flows (beyond the financial) can sway the interest of the involved organizations towards the business model, as well as its viability. Neglecting flows like innovative industrial formulas, annual reports, brand recognition, reputation or prestige may imply the omission of relevant information for the business model sustainability. In the literature, we also noticed that most of the proposals did not focus on the study of an inter-organizational business model, but on the business model of a particular organization. In order to enrich our research with viewpoints on complex network arrangements, we also focused our attention on value constellations, strategic networks, and value networks. Our analysis suggested the necessity of describing business models in detail to create a common ground and enable discussion. The obtained insights stressed the urgency in introducing in the business model study the specificities of the network environment and of its elements (e.g., collaborations, dependencies, conflicts, or joint value propositions). In spite of this awareness, there were no indications on how to approach the issues raised in the business model sub-domains of research. This partial vision in which the network concept is faded away hinders the inter-organizational business model understanding and, consequently, the translation of its restrictions in the high-level requirements of its information system.

To take into account the socio-technical nature of networked business models, we complemented our understanding of the business model domain with inputs from Actor-Network Theory (ANT) (Chapter 3). Its insights were especially significant, since they brought to our research the social context of the network and of its elements.

ANT characterizes a network by its relations, fluidity, and dynamics, matching aspects that we consider relevant when analyzing inter-organizational business models. It incites us to follow the elements of the network, disclose their partners, perceive their interactions, and search for the alignment of their interests. ANT goes beyond the traditional conceptualization that views networks as a collection of nodes and connections that form a web-like structure (Barab et al., 2001). It guides us into a world of associations and relations without considering distance or measurement, challenging our notions of far/close, small scale/large scale and inside/outside (Latour, 1996b). The actor-network spatial and temporal implications are profound, since it recognizes that “what is acting at the same moment in any place is coming from many other places, many distant materials, and many faraway actors” (Latour, 2005, p. 200). To include ANT’s viewpoints in our approach, we established connection points between them and the issues covered by business model theory.

ANT’s perspective of time and space reinforced the importance we had already detected in comprehending the context and dynamics of business models. Its influences and concepts helped us obtain clues on how to perceive the level of satisfaction of the network elements. It inspired us to detect problematic situations and disclose alternatives to mitigate them, thus strengthening the business model viability. Furthermore, ANT’s worldview of a network as a collective of human and non-human actors, a heterogeneous reality built of multidimensional and continually evolving entanglements (Grabher, 2006), showed us a new dimension of analysis. Its unique perception complemented our understanding on how information systems influence – and are influenced – by the contexts of their business models and helped us establish connections between these two domains. Taking into account that information systems often fail, usually more due to social and organizational factors than technical ones (Carbone, 2004, Graham, 2008, Doherty and King, 1998), ANT gave us the chance to regard the role that non-human actors possess and their impact on the network. Furthermore, it encouraged us to include in our research a link between the knowledge acquired on human actors and the roles of non-human, revealing how human interests are materialized in non-humans.

1.3 Research purpose and questions

Based on the established theoretical background and on the gaps identified in the previous section, we formulated the following research purpose:

> *The purpose of the thesis is to develop BIZ2BIS: an approach to discuss, design, and evaluate inter-organizational business models, which will equally contribute to disclose their underlying information system requirements. By exploring the socio-technical nature of business models in a networked configuration, the approach aims to be used as an effective means to guide the search towards beneficial arrangements of value propositions that can lead to stable networks.*

The conducted literature review helped us generate the theoretical underpinnings that led us to the formulation of the following research questions:

RQ1. How can the discussion, design, and evaluation of business models in network configurations benefit from the contribution of ANT?

The work progress clarified and detailed directions of research, providing the knowledge to refine RQ1 as presented below:

a. How to account for socio-technical aspects in business models?

b. How to identify the stakeholders and represent a networked business model so that it is clear to all involved?

c. How to create an approach capable of aligning the goals of the various stakeholders?

d. How can indications about the business model stability be provided to stakeholders?

e. How to consider the dynamic nature of inter-organizational business models?

The need to overcome the gap between business models and the information systems domain also gave rise to the additional research question:

RQ2. How can business model requirements (including its social context) be translated to its underlying information system specification?

Inspired by ANT's "lens of investigation" and adapting its tenets to the business model domain, we explored the socio-technical nature of networked business models and used the obtained insights to develop BIZ2BIS (from Business Models to the Blueprint of the Information System). ANT's ability to reveal network spaces, their human and non-human actors, existing relationships, and dynamics offered us tools to describe and perceive how business models can be shaped by social, political, economical, organizational, and technological issues. The combination of these contributions with the ones from the business model field enabled us to create innovative ways of disclosing what drives stakeholders, unveil their interactions, identify problematic occurrences, and mediate their interests. BIZ2BIS uses the gathered wealth of information to obtain indications to mitigate threats, strengthen business models, and support and smooth the specification of the high-level requirements of their underlying information systems. Furthermore, the approach offers additional confidence on their suitability to satisfy the demands and expectations of the network participants.

1.4 Relevance of this thesis

ICTs have been steadily transforming the way companies conduct business. Technological developments in fields such as enterprise application integration, message oriented middleware, and service oriented architecture, provided the necessary resources to develop infrastructures, platforms, and applications into separate layers that can be combined among several organizations. The conditions created have indisputably sharpened the need for innovation and companies have been increasingly led to explore new configurations that may transcend their traditional boundaries. For example, by sharing their business processes, a set of firms from different industries has the possibility of offering very complex services that would otherwise be impracticable.

Throughout this research, we were involved in the study of scenarios in which several entities cooperated to achieve a certain goal. The established contacts enabled us to witness that those responsible for the business models ideas and for their implementation faced difficulties in their specification. They were unaware of the topics that should be addressed, as well as the techniques that could be used to represent and describe the business model. These flaws contributed to the limitation of the available information at an initial stage of the study, which made it difficult to discuss the ideas in question and detect possible incoherencies.

BIZ2BIS intends to be a source of systematized knowledge aiding those interested in designing, evaluating, and refining inter-organizational business models. It consists in an iterative and incremental process of negotiation that seeks the alignment of the stakeholders’ interests, so that each one can find an attractive value proposition. The perception of the interactions, influences, aims, and dynamics of the networked business model enables the disclosure of the interplay of interests, identify its strengths and weaknesses, and assess its stability and viability. These are valuable tools to discover actions that can promote the stakeholders’ continued commitment to the business model (e.g., future features to develop), strengthening its stability and enduring success. Furthermore, we use the information collected to aid specifying the information system that will support the idealized business model.

We engineered BIZ2BIS to be light, while combining textual and graphical techniques. It is organized in four phases. In the first, we characterize the network by identifying its actors and their relationships, as well as the structural aspects that influence their behavior. In the second phase, we analyze the network and suggest eventual adjustments to better align the interests of the stakeholders, so that each can find an attractive and sustainable value proposition. In the third phase, we assess the business model stability according to the perspectives of its stakeholders, in order to detect possible dissatisfaction that may compromise its network. The outcome is a balanced network of interests that documents the actors' roles, their interactions, contributions, aims, and value propositions. Based on this stabilization of the networked business model, in the fourth phase the approach derives high-level requirements for its underlying information system. The obtained requirements will guide the work of the team responsible for the deployment of the information system that will support the business model.

Although it is unquestionable that an inter-organizational business model influences and is influenced by the individual companies own business models, this study does not aim to describe the latter. It explores the existing bi-directional connection, but its scope is the network of organizations. Moreover, we state that, in spite of BIZ2BIS being an approach that aids in the discussion, design, and evaluation of the business model, it cannot provide assurance that it will be successful. There are always unexpected factors and occurrences that can limit this type of study (e.g., a change in a governmental law, a new technological trend, an unexpected conflict between organizations, an erroneous importance assigned to a value proposition, a miscalculated cost, or value propositions whose importance vary with time).

1.5 Research approach

To answer the proposed questions, we started by conducting a literature review on business models. The gathered knowledge reinforced our belief in the advantages of analyzing business models with a socio-technical focus. It also provided some premises that guided our study and assisted us in the refinement of the research questions (quite general at this stage).

We used the identified premises as a basis for the development of BIZ2BIS, which was applied to three case studies carried out in sequence. The first one (HowMuchIsIt) addressed the business model employed in a portal-supported mediation service for the acquisition of technological equipment. The second (Online Journal) involved the development of a journal portal and the assessment of sound business models for its activities. The third case (GreenHomes) was concerned with improving environmental efficiency in a community supported by an IT platform. All three cases covered common aspects of the sub-research questions. All were focused on how ANT's notions could be suitably applied to the study of networked business models, creating a common background of knowledge that could be clear to all the actors involved. The specificities of each case (e.g., availability of funds and aims of the stakeholders) prevented us from completely addressing our sub research questions. For instance, HowMuchIsIt allowed us to tune evaluation issues. The Online Journal aided us in perceiving how business model restrictions could be used to specify the high-level requirements of its information system. In turn, GreenHomes enabled us to develop negotiation mechanisms to balance existing interests. During our research, case studies acquired a formative role, they aided us to gradually confirm and reveal relevant lines of research, refining our research questions. They tuned our approach and endowed it with a level of maturity that gave us some reassurance about its capacity to address rather complex cases.

To continue our research, it was fundamental to go into the world of practitioners, work in close collaboration with participating organizations, jointly apply our approach, and use its insights to intervene on the business model under study (which had not been done so far). It was crucial for us to understand if the feedback of our analysis and evaluation was an added value to solve their problems. InovWine, a project in the wine sector with the aim of enhancing wine quality and production through technological support, was the answer to our expectations. We adopted action research when applying BIZ2BIS to help design its business model. Its suitability to address partially defined and ill-structured problems (like most of the business model ideas at an initial stage) and the chance to intervene in a real complex business model contributed to this choice.

We were able to inquire into InovWine by following the actors and disclosing vital interplays among technical, economic, organizational, human, cultural, and political aspects. Action research allowed us to reinforce our perception on ANT's ability to reveal, enhance, and detail contextual influences with impact on business models. The partnerships developed during InovWine allowed us to merge research with practice. Practitioners were encouraged to reflect on how BIZ2BIS was being applied and to regularly discuss the proposed interventions, as well as its outcomes. The obtained feedback contributed to the achievement of their goals and was used to enhance our approach. Furthermore, the collaborative and action-oriented nature of the applied research strategy, combined with the need to develop a supporting information system for InovWine, created a privileged scenario to explore how a bridge between business models and information systems could be set up. We had the chance to use BIZ2BIS in the analysis and design of the business model together with others involved in its development. Supported by the BIZ2BIS' artifacts, we translated the insights obtained into the high-level requirements of InovWine's information system in a systematized way. These requirements were used by the elements of the team responsible for the system deployment as their main source of information. Based on this experience, they provided relevant feedback on the suitability of the provided information and on BIZ2BIS' potential.

1.6 Outline

The remainder of this thesis is organized as follows:

Chapter 2: Business models. We present the origins of the concept, clarify its scope in this dissertation, and provide an overview of the literature on the subject. Next, we enrich this vision by complementing it with the study of approaches focused on business models operating in complex network arrangements, such as value constellations, strategic networks, and value networks. This theoretical exploration started to construct the beliefs with which we started to conceptualize BIZ2BIS.

Chapter 3: The social dimension of business models. We offer a detailed introduction to ANT and highlight key concepts that will be used throughout this thesis. Then, we explain its emphasis on following the actors, thinking of the human, the social, and the technical all at once.

We reflect on business models in all their complexity, searching inspiration in ANT to understand and discuss the network, conceive procedures that can reinforce the alignment among its participants, and strengthen the stability and success of their business models. To complement ANT's view, Structuration Theory and Social Capital are also explored in this chapter. Their potential contributions toward the business model domain are discussed.

Chapter 4: Research strategy. We present the philosophical assumptions underpinning this research, as well as the research strategy we followed. Next, we introduce case study and action research, describe how they were carried out, and discuss their contribution to expose the iterative advances that led to BIZ2BIS. Particular attention is given to the rigor, validity of the performed research, and to the generalization of the results obtained.

Chapter 5: BIZ2BIS: business model and IS design. Building on the previous chapters, we introduce and describe the major contribution of the dissertation: BIZ2BIS, the approach to guide the discussion, design, and evaluation of networked business models. The approach also derives the high-level requirements of the information systems that will support these business models.

Chapter 6: The roadmap to the BIZ2BIS proposal. We begin by discussing how the case studies contributed to the development of BIZ2BIS. Then, we detail how action research guided its use in a rather complex project and the findings we obtained for the involved practitioners and for the enhancement of BIZ2BIS. Finally, we present a chronological evolution of the conceived artifacts.

Chapter 7: InovWine: an example of using BIZ2BIS. We illustrate from the InovWine project how the future users of BIZ2BIS can employ it in a concrete networked business model. We use the approach to describe the scenario under study, diagnose problems, support negotiations, conceive interventions, evaluate value propositions, and reflect on the obtained findings (for researchers and practitioners).

Chapter 8: Conclusions. We start by presenting the contribution of this thesis in addressing the research questions and their implications. Then, we point out its theoretical implications and provide recommendations to practitioners. We close by discussing its limitations as well as opportunities for further research.

Chapter 2

Business models

A business model is a blueprint for how a business generates and captures value from services or products (Chesbrough and Rosenbloom, 2002). It can be used as a frame of mind to articulate on-going ideas, as well as discuss, understand, communicate, describe, and analyze the aims and prospects of an organization or networks of organizations. The outcome of its study facilitates choices for corporate decision makers. Furthermore, by informing the design of its underlying information systems it also supports a link to the technological domain. It is unquestionable that business models matter. An initiative, when taken to the market through different business models, will present distinct results (Weill et al., 2005, Chesbrough, 2010). Therefore, organizations can not afford "fuzzy thinking" about their business models (Magretta, 2002). They should continuously nurture them to support their activities and adapt them according to their needs (Pateli and Giaglis, 2004, Osterwalder and Pigneur, 2010).

The main driving force behind the focus of attention on business models has been the creation of new opportunities by information and communication technologies (ICTs), especially the Internet (Afuah and Tucci, 2003, Zott et al., 2011). They have provided the chance to support the re-evaluation of the (traditional) business model concept, as more and more organizations have tried to understand how to develop their models in creative and successful manners (Seddon et al., 2004). Having the right business model became a key factor in understanding how organizations can accomplish their goals.

In this chapter, our contribution is twofold. First, we present an up-to-date literature review on business models and critically discuss the gathered insights, while searching for shared aspects and dissonances. Second, grounded in relevant literature, we point out gaps and present suggestions for features to be included in our approach. To organize our findings, we made use of the topics addressed on the framework of Pateli and Giaglis (2003).

In section 2.1, we begin by following the hot debate around the meaning and purpose of the concept business model. Next, we analyze business model taxonomies to understand the identified categories. After that, we present the evolution on business model components, from items presented as "shopping lists" to frameworks that address the relationships among them. Then, we discuss business models adoption factors, evaluation, and change methodologies. In section 2.2, we look upon the potential offered by network configurations to the business model domain.

Finally, in section 2.3, we bring up features to integrate in our proposal based on common denominators, critics, limitations, and future trends identified in the literature review.

At the end of the chapter, the reader should be able to:

- Have a holistic perspective of the business model domain;
- Understand how ICTs have impacted business model analysis and design;
- Identify open issues in the study of networked business models;
- Be aware of our main guidelines for the development of an approach that addresses the challenges and needs of the study of networked business models.

2.1 Business models theoretical framework

When we started our literature review on the business model domain, we tried to chronologically analyze contributions to outline their evolution. We soon realized the large amount of proposals and the diversity of the domains addressed. Meanwhile, we came across the work of Pateli and Giaglis (2003), who had already detected the absence of theoretical tools to organize the research in this field. With the aim of further maturing the domain and creating a foundation on past research, they developed an explanatory framework on business models based on identified themes and detected patterns. The framework decomposes the business model field into seven research sub-domains, as follows:

- Definitions – describe the purpose, scope, and what constitutes a business model;
- Taxonomies – classify business models into a number of typologies based on various criteria;
- Components – decompose the business model into its fundamental constructs;
- Conceptual models – propose representational formalisms for visualizing the main components of the business model. In more comprehensive proposals, they identify and describe the relationships among these components;
- Adoption factors – analyze factors that affect the organizational adoption of business models, as well as research on socio-economic implications of business model innovation;
- Evaluation models – identify criteria for assessing the feasibility, viability, and profitability of new or established business models;
- Change methodologies – formulate guidelines for either changing existing business models or choosing new ones to adapt to an innovation.

We used this framework to classify and structure our literature review. The analyzed publications were identified based on the number of citations or on their contributions to the field. They are systematized in Table 1 according to the framework sub-domains. Some of the authors addressed had already been mentioned in Pateli and Giaglis (2003, 2004). These contributions are marked with an asterisk.

Table 1: Business model contributions

Researchers	**Definitions**	**Components**	**Taxonomies**	**Conceptual models**	**Adoption factors**	**Evaluation models**	**Change methodologies**
Timmers (1998) *	✓		✓				
Hamel (Hamel, 2000) *		✓				✓	
Linder and Cantrell (2000) *	✓	✓	✓	✓			✓
Mahadevan (2000) *		✓	✓				
Papakiriakopoulos et al. (2001) *		✓					✓
Rappa (2000) *	✓		✓				
Tapscott et al. (2000) *	✓		✓	✓			✓
Alt and Zimmermann (2001) *		✓	✓				
Amit and Zott (2001) *	✓						
Hawkins (2001)	✓						
Petrovic et al. (2001) *	✓	✓					✓
Weill and Vitale (2001) *	✓	✓	✓	✓		✓	
Chesbrough and Rosenbloom (2002) *	✓	✓					
Gordijn (2002) *, Gordijn et al. (2000)	✓	✓		✓		✓	✓
Magretta (2002) *	✓						
McGann and Lyytinen (2002)					✓		
Stähler (2002)	✓	✓					
Afuah and Tucci (2003)		✓				✓	
Pouloudi et al. (2003) *					✓		
Haaker et al. (2004)	✓						
Osterwalder (2004), Osterwalder and Pigneur (2010)	✓	✓		✓			
Rayport and Jaworski (2004)		✓					
Bouwman et al. (2005a), Bouwman et al. (2012)	✓	✓		✓	✓	✓	✓
Morris et al. (2005)	✓	✓					
Shafer et al. (2005)	✓	✓					
Stanoevska-Slabeva and Hoegg (2005)		✓					
Andersson et al. (2006)	✓						

Researchers	Definitions	Components	Taxonomies	Conceptual models	Adoption factors	Evaluation models	Change methodologies
Kallio et al. (2006)	✓						
Al-Debei and Avison (2010)	✓						

Source: Expanded from Pateli and Giaglis (2004).

We also used the framework to organize the structure of the subsequent sections. Each one of the identified business model sub-domains resulted in a section of this chapter. We only made two minor adjustments. The first was based on the reviewed literature, which led us to substitute the designation “Taxonomy” for “Typology”. The second was merging “Components” and “Conceptual models” to facilitate reader understanding, due to the strong dependencies between them.

2.1.1 Definitions

Osterwalder et al. (2005) traced the origins of the business model discussion in scholarly business journals and obtained results that go back to articles published in 1957 and 1960 (Bellman et al., 1957, Jones, 1960). According to Ghaziani and Ventresca (2005), the public talk about these topics started in the early 1970s. The term was applied to describe and map business processes and information and communication patterns within a company for the purpose of building an information technology system (Stähler, 2002). From the 1990s onwards, the concept gained relevance in everyday business news and non-academic magazines (Stähler, 2002), and it has been gathering momentum since then (Zott et al., 2011). Chesbrough and Rosenbloom (2002) found 107 000 references to the term “business model” searching on the Internet. In 2012, we found approximately 33 800 000 sources with reference to the term on the Google search engine.

We focused our initial research effort on the clarification of the business model concept in order to leverage our capacity to understand, cover, explore, and apply it. Numerous definitions have been outlined. Despite an intuitive understanding that seems to be widespread, a careful analysis of the expression shows different perspectives and persistent confusion. The concept is used to describe everything from how a company profits to how it structures itself. For example, sometimes the concept can be used in perspectives as diverse as: describe coordination mechanisms in economic processes, discuss intermediation or disintermediation trends, represent a conceptual and architectural implementation (blueprint) of a business strategy, or address a particular type of business model. While some authors are intrigued by one particular aspect, others assign it little significance and concentrate their attention on different features. Even in the information systems literature, alone, different terms, such as Internet business model (Afuah and Tucci, 2001), business model in electronic commerce (Mahadevan, 2000), business model on the web (Rappa, 2000), and “electronic business model” (Osterwalder, 2004, Horsti, 2007), are used interchangeably to address the concept.

The lack of consensus around the business model concept made it earn the label of being the most discussed and least understood aspect on the web (Rappa, 2000, Alt and Zimmermann, 2001). Even today, the community has not been able to form and recognize a universal definition and the term draws considerably differing opinions on its compositional facets (Al-Debei and Avison, 2010). Al-Debei and Avison (2010) advanced three reasons for the murkiness around the business model term. First, the youthfulness of the domain and of its associated research. Second, the fact that it comes from distinct fields (e.g., computer science, management, and economics), which provides a variety of analysis lenses. The backgrounds of the researchers influence their motivations, aims, options, and contributions. This raises difficulties in coordinating efforts or standardizing notions, but offers different sources of inspiration that can enrich the research. Third, the newness of sectors within which the concept is being investigated (e.g., mobile providers).

In Table 2 we present an overview of different definitions available in established publications in the period 1998-2010 (right and middle column), as well as the main elements addressed by each of them (right column). Next, we will discuss some of these definitions and identify similarities and differences among them.

Table 2: Business model definitions

Author	Business model definition	Elements of the concept
Timmers (1998)	An architecture for the product, service and information flows, including a description of the various actors and their roles; a description of the potential benefits for the various actors; and a description of the sources of revenues	Business architecture Business actors/roles Value proposition Revenue sources Business benefits
Gordijn et al. (2000)	A business model answers the question: "who is offering what to whom and expects what in return?" It explains the creation and addition of value in a multi-party stakeholder network, as well as the exchange of value between stakeholders.	Value proposition Revenue sources Network partnerships Business actors
Linder and Cantrell (2000)	The organization's core logic for creating value. The business model for a profit-oriented enterprise explains how it makes money	Value proposition Revenue sources Business architecture
Rappa (2000)	The method of doing business by which a company can sustain itself, that is, generate revenue. The business model spells out how a company makes money by specifying where it is positioned in the value chain	Revenue sources
Tapscott et al. (2000)	A business model is about the invention of new value propositions that transform the rules of competition, and mobilize people and resources in a network configuration to unprecedented levels of performance	Value proposition Network partnerships Business architecture
Amit and Zott (2001)	It depicts the content, structure, and governance of transactions so as to create value through the explosion of new business opportunities	Business architecture Value proposition Governance
Hawkins (2001)	A description of the commercial relationship between a business enterprise and the products and/or services it provides in the market. More specifically, it is a way of structuring various, cost and revenue streams such that a business becomes viable, usually in the sense of being able to sustain itself based on the income it generates	Market segments Revenue sources
Petrovic et al. (2001)	A description of the logic of a "business system" for creating value that lies behind the actual processes	Value proposition Business architecture
Weil and Vitale (2001)	A description of the roles and relationships among a firm's consumers, customers, allies and suppliers that identify the major flow of products, information, and money, and the major benefits to participants	Business architecture Business actors/roles Value proposition Revenue sources Business benefits Network partnerships
Chesbrough and Rosenbloom (2002)	A framework that takes technological characteristics and potentials as inputs, and converts them through customers and markets into economic outputs	Technological trends Revenue sources Business architecture Market segments
Magretta (2002)	The business model tells a logical story explaining who your customers are, what they value, and how you will make money in providing them that value	Value proposition Revenue sources Market segments Link with strategy
Stähler (2002)	A model is always a simplification of the complex reality. It helps to understand the essentials of a business or to plan how a future business should look. It answers the following 4 questions: What value the business creates for its stakeholders? - What does it sell? - How and through what configuration is value created? - With what it is possible to earn money?	Reality simplification Dynamic nature Value proposition Market segments Business architecture Revenue sources

Author	Business model definition	Elements of the concept
Bouwman et al. (2005a)	A blueprint of four interrelated components: service offering, technical architecture, organizational and financial arrangements	Reality simplification Value proposition Revenue sources Market segments Business architecture Network partnerships Technical architecture
Osterwalder et al. (2005)	A business is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenues streams	Reality simplification Value proposition Revenue sources Market segments Business architecture Network partnerships Distribution channel
Morris et al. (2005)	A concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets	Link with strategy Business architecture Value proposition Revenue sources Market segments
Shafer et al. (2005)	A representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network	Link with strategy Value proposition Network partnerships
Andersson et al. (2006)	It makes clear who the business actors are in a business case and how to make their relationships explicit. Relations in a business model are formulated in terms of values exchange between the actors	Business actors Value proposition Network partnerships
Kalio et al. (2006)	It is the means by which a firm is able to create value by coordinating the flow of information, goods and services among the various industry participants it comes in contact with including customers, partners within the value chain, competitors and the government	Business architecture Value proposition External influences Network partnerships
Al-Debei and Avison (2010)	It is an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization presently and in the future, as well as all core products and/or services the organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives	Reality simplification Value proposition Business architecture Dynamic nature Revenue Sources Link with strategy

Source: Expanded from Al-Debei et al. (2008).

Timmers (1998) was one of the first to explicitly define the business model concept. This author is considered a pioneer in this domain. He looks at a business model from different angles. On the one hand, he regards the architecture for the products, services and information flows, including a description of the various actors, their roles, and interactions. On the other hand, he takes into account potential benefits for the various actors, as well as sources of revenues. Like Timmers, Weil and Vitale (2001) focused their work on the identification of the main factors that can characterize a business model and explain the creation of value to participants. According to them, a business model is a description of the roles and relationships among a firm's customers, allies, and suppliers that identify the major flow of products, information, and money, as well as the achieved benefits. Other definitions have spread since then, with different aims and diverse focus of research. For instance, Linder and Cantrell (2000), Petrovic et al. (2001), Amit and Zott (2001) proposed more abstract definitions, in which they emphasize the importance of the business value propositions. Others, like Rappa (2000) and Hawkins (2001), essentially covered financial elements of the value propositions, due to their importance to the business model sustainability. This emphasis on the economic dimension is usually associated with the search for competitive advantage.

The relationship between business models and strategy was reinforced by Shafter, Smith, and Linder (2005) and Morris et al. (2005), who integrated the notion of strategic choice into the definition of the business model concept. Osterwalder and Pigneur (2002) adopted a different view. They positioned business models as the link between strategy and business processes. These authors argue that business models can work as a shared and common understanding of the domain that facilitates communication between people, in order to guarantee a smooth strategy execution.

In their research on business models, Linder and Cantrell (2000), Magretta (2002), Chesbrough and Rosenbloom (2002), and Stähler (2002) also contributed in distinguishing the difference between business models and strategy. Magretta (2002) offers a more process-oriented perspective: “a story that explains how an enterprise works”. This author argues that business models describe how the pieces of a business fit together, but, unlike strategy, do not factor in one critical dimension of performance: competition. Chesbrough and Rosenbloom (2002) underline that the business model puts more focus on customers and how to deliver them value, while strategy addresses more macro-level issues (e.g., creation of value for shareholders). In turn, Linder and Cantrell (2000) underline that strategy should communicate how the change in the business model is intended to take advantage of shifting markets and new opportunities. Stähler (2002) also gave input on the relationship between business and strategy and showed how a deliberate change or an innovation in a business model can be strategic. This author also introduced another role assigned to the business model; he emphasized the idea that a model is a simplification of the complex reality, which helps understand the business or plan how it should be conceptualized and performed.

In their definitions, researchers like Rappa (2000) and Osterwalder (2004) address the business model of a particular entity (e.g., a company). Others emphasize the relevance and impact of the network configuration (Tapscott et al., 2000, Amit and Zott, 2001, Haaker et al., 2006, Kallio et al., 2006, Andersson et al., 2006). For instance, Tapscott et al. (2000) introduced the idea of business webs, which include not only the organization itself, but its partners (e.g., suppliers, distributors, commerce service providers, and infrastructure providers). The established network gathers entities from distinct sectors, with diverse interests, which can contribute to the business web achievements.

More recently, detailed working definitions (which point out what constitutes a business model) were proposed and used as the basis for the development of more comprehensive frameworks (Gordijn, 2002, Osterwalder et al., 2005, Bouwman et al., 2005a, Bouwman et al., 2005b). The latter two contributions also highlight the role of technology, which had also been be done by Chesbrough and Rosenbloom (2002), reflecting the importance of the authors contexts in their research (all have maintained strong connections with the information systems domain). For instance, Bouwman et al. (2008c) focus their attention on provided services.

In our approach, we mainly address business model scenarios in network configurations supported by information and communication technologies. However, our scope is broader than pure play Internet business models. When setting the boundaries of the business model we also consider offline presences, since some of their behaviors can have severe implications on the network. For instance, a brick-and-mortar company can control the access to an asset essential to the network, whose absence can compromise its goals. We consider that an electronic business (e-business) is just one more type of business. For this motive, when in the future the term "business model" is applied in this document, it will concern business models that are largely supported by the Internet, but that can also consider offline activities. This option is supported by Hamel (2000), who claims that thinking about "e" as a pure play business model is not the right way to look at it. Or by Rayport (1999), who claims that "In the end, an e-business is just another business".

Business models are subject to a set of influences (e.g., unexpected economic scenarios, market issues, regulatory trends, or social, political, and organizational issues) that boost their dynamic nature. The relationships in network configurations enclose a level of complexity that amplifies this dynamics. We not only have to take into account the external factors at a certain moment, but also manage the delicate balance among the individual expectations of the business models' participants and the overarching aims of the network. Authors like Stähler (2002) and Al-Debei et al. (2008) emphasize the dynamic nature of the business models in their definitions. However, it is not one of the aspects more discussed in the definitions. The same applies to the external influences that may affect business models.

The elements identified in the right column of Table 2 are presented in an alternative configuration in Figure 1. Our aim is to outline the topics usually mentioned in the literature and, at the same time, we indicate and emphasize (through larger font sizes) the ones that appear more frequently. Through the performed analysis, we confirmed the diversity of definitions and how they differ significantly in scope. Even so, it was possible to detect common denominators, as we will detail.

Figure 1: Elements to cover when studying business models

Most definitions covered value proposition issues, with two different approaches: the way an organization creates value, with its partners, for its customers; and how an organization, together with its stakeholders, creates value for each party involved (Al-Debei and Avison, 2010). We also detected many references to the business architecture, which discusses the required resources and capabilities of a firm to implement a business model, including its technological architecture, organizational infrastructure, and their configurations. Many definitions also assign relevant importance to the business network, which clarifies how the various stakeholders interact with each other, the performed roles, and how value is exchanged. We note that organizations are not the only ones included in the network. For instance, customers also have a key role (Chesbrough and Rosenbloom, 2002, Osterwalder et al., 2005). The presented definitions also address the earnings logic, showing the importance of explaining how the firms expect to generate revenues from their activities. Like Allee (2000) and Al-Debei and Avison (2010), we consider that financial aspects represent an important dimension of the created value, however it is not the only one. Ultimately, the object of study can be a not-for-profit business model. We argue that to gather a broader perspective of the business model we must consider flows like data, prestige, influence, or social responsibility. Taking into account our research aims, we also assigned a main role to technological aspects of the business model and to how its context can influence it.

In the available definitions of the business model concept, we can notice the influence of different contexts and the impact of distinct purposes, as well as the difficulty in capturing its holistic perspective. This gap reinforces the importance of this review, since it allowed us to obtain clues of business model’s elements that can be integrated in our approach. Nevertheless, to obtain a comprehensive perception of the domain it is also important to clarify the available business models. To make this clear, several authors classified and grouped them into specific categories based on a set of criteria. These categories are usually designated by typologies, and will be described in the next section.

2.1.2 Typologies

Typologies identify, describe, and cluster the plethora of perceived business models, mainly enabled by Internet, into different groups (Zott et al., 2011). Due to their higher level of abstraction, they make the discussion, understanding, and communication on business models easier than definitions or components.

The ongoing research concerning business model has proposed several typologies, sometimes in slightly modified or more detailed versions. Similarly to business model definitions, the variety of available classifications causes misunderstandings and increases difficulties in building a unique and coherent picture. Each business model typology has its own categorization criteria, consistent with the perspectives of its authors, neglecting, in most cases, the literature on business model and the possibility to reuse and consolidate the existing classifications. In general, the available typologies are essentially lists of business activities, which are described by formless narratives, or through the use of a few variables that regard specific viewpoints (Lambert, 2006).

Even the designations assigned by the researchers to name their work differ considerably and illustrate the lack of standardization. For instance, some use the term “typology”, others “taxonomy”, “classification”, “classification scheme”, or “operating business models”. According to Lambert (2006), typologies are derived conceptually and are the product of deductive research. Their strongest aspect is their ability to simplify complex terms by classifying objects according to few criteria at a time, which serve specific purposes, despite their limited range. In contrast, taxonomies are derived empirically and are the result of inductive research using multivariate analysis to identify natural groupings. Based on these definitions, we have adopted the designation “typology”.

According to the literature, the criteria applied by the available proposals differ, and can include factors as diverse as: product types, financial arrangements, technological developments, marketing concepts, or core activities. The existing diversity resulted in quite distinct typologies (Canzer, 2006). The researchers have not reached a consensus beyond broad categories that permeate the literature, such as in buyer type (e.g., B2B, B2C, and B2G) (Lambert, 2003). To complicate matters, business typologies are permanently evolving due to the continuous need of business models’ adaptation, which may lead to the appearance of new ones, rendering present categorizations obsolete.

In Table 3, we list a compilation of some of the business model typologies identified in the literature to illustrate the diversity in the levels of abstraction and criteria adopted by the researchers. We kept the original designations given by their authors. We note that this summary does not intend to be representative or comprehensive with respect to the full range of classifications.

The classification scheme proposed by Timmers (1998) is one of the seminal contributions. By analyzing the possible architectures for business models, this author distinguished eleven possible ways of doing business (Figure 2). Timmers mapped the models according to their degree of innovation and their functional integration. In the lower left-hand corner are basic e-shops, which are electronic versions of their physical counterparts. On the other extreme, at the upper right hand corner is value chain integration, which is dependent on information technology to support the business flows and generates value from integrating those flows. Nonetheless, this author does not provide any insight into the architecture of the presented business models.

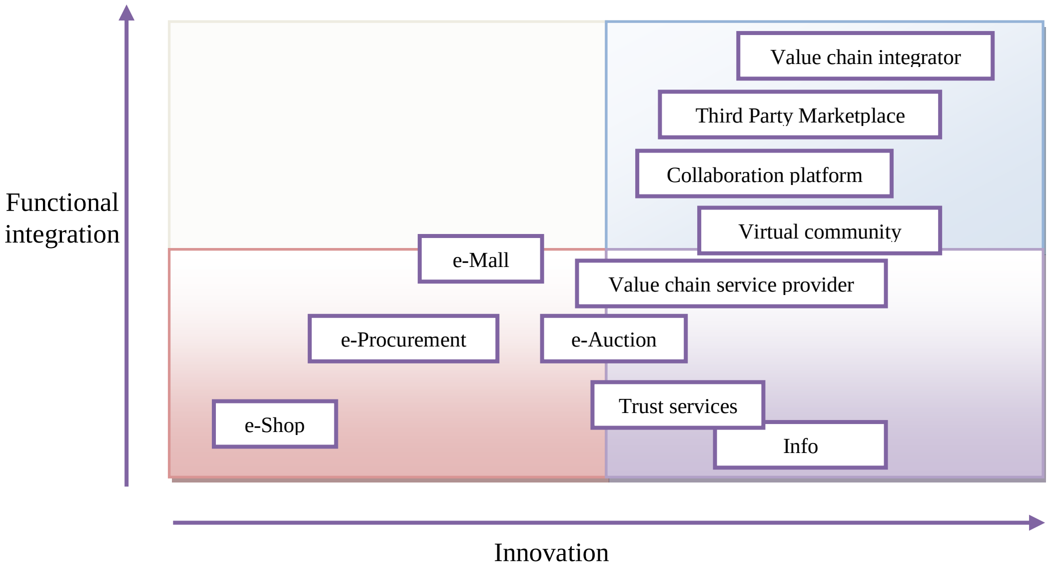


Figure 2: Timmers' classification of Internet business models

Source: Adapted from Timmers (1998).

Bambury's (1998) philosophical view of the free flow of information on the Internet strongly influenced his proposal (Table 3). This author's classification, related to the production of e-content, is divided into two sets: those which pre-date the Internet and which have since been modified or merely transplanted to suit the Internet context (the first eight); and those which have only come into existence as a result of the possibilities provided by the Internet (the remaining six). In addition, Bambury also discusses aspects like the involvement of governments and regulations concerning the trade of personal information.

Table 3: Business model classifications

	Description of business model classifications	
Timmers' (1998) classification	**e-Shop**	Allows web marketing. It aims to promote the organization and its goods or services. Increasingly added is the possibility to order and to pay
	e-Procurement	Consists in electronic tendering and procurement of goods and services. It permits a wider choice of suppliers, which can lead to better conditions
	e-Auction	Offers an electronic implementation of the bidding mechanism. Usually this function is integrated with contracting, payments, and delivery features
	e-Mall	Consists of a collection of e-shops, usually enhanced by a common umbrella
	3rd party marketplace	Suits situations where companies wish to leave the web marketing to a 3rd party (possibly as an add-on to their own channels)
	Virtual communities	Describes models that obtain value from the actions of its members (customers or partners). Can be an important add-on to other marketing operations
	Value chain service provider	Specializes on a particular function for the value chain, such as electronic payment, with the intention to make that into their competitive advantage
	Value chain integrators	Represents the companies that focus on integrating multiple steps of the value chain
	Collaboration platforms	Provides a set of tools and an information environment for collaboration among enterprises
	Information brokerage	Gathers a range of services to add value to the huge amount of data available on the open networks or coming from integrated business operations
	Trust and other services	Embraces a special type of services, the ones provided by certification authorities, electronic notaries, and other trusted third parties
Bambury's (1998) classification scheme	**Mail-order**	A web site shop front is employed to sell physical goods which are then posted or delivered
	Advertising	The advertising revenues support the operation of a free service
	Subscription	Subscribes of a digital service for a specified period of time
	Free trial	A service is available for free but will only work for a limited period or will not be fully functional until a fee is paid
	Direct marketing	A product advertising is performed through the use of a personal electronic e-mail
	Real estate	Sell web features like: domain names and e-mail addresses
	Incentive schemes	Offers a benefit to entice customers to have a certain behavior
	Business to business	Entails the business relationships between companies via the Internet
	Combinations	Combines various business models
	Library	Offers free information
	Freeware	Provides the free access to services
	Information barter	Involves some sort of exchange of information over the Internet between individuals and companies
	Digital products and delivery	Covers digital products' transactions
	Access provision	Includes activities that support Internet access
	Web site hosting and other Internet services	Provides services such as hosting web services, electronic mail and re-direction services

Description of business model classifications

Linder and Cantrell's (2000) overview of operating business models	**Price**	Includes several options to charge clients (e.g., round up buyers with attractive prices and use purchase volume to gain discounts)
	Convenience	Provides propitious conditions to promote a product/service (e.g., attract busy buyers who will pay a premium for convenience)
	Commodity-plus	Explores useful items that can be turned into commercial advantage (e.g., predictable commodity service wins customers who pay a small price)
	Experience	Offers special conditions of access and interaction (e.g., use a carefully designed environment to attract customers who pay premium prices)
	Channel	Characterizes the means used to access and communicate with customers (e.g., focus on particular target audience or provide expert advice about how to use items effectively)
	Intermediary	Describes models in which an entity acts as a mediator (e.g., use appealing content to draw the attention of an audience in order to convert that attention to advertising)
	Trust	Provides services to nurture the users' expectations and earn their confidence (e.g., fault-tolerant systems and security mechanisms)
	Innovation	Offers unique services (e.g., use research and development skills and explore opportunity identification)
Weill and Vitale 's (2001) typology of atomic business models	**Content provider**	Distributes contents (information, products, or services) in digital form to users, via intermediaries
	Direct to consumer	Establishes direct interaction among customers and providers, frequently bypassing traditional channels members
	Full service provider	Offers a full range of services in a specific domain that demands multiple services or products (e.g., financial services and health care)
	Intermediary	Concentrates information that allow to link buyers and sellers
	Shared infrastructure	Brings together competitors through the use of a common information technology infrastructure, which allows the development of collaborations
	Value net integrator	Coordinates flows among the business elements by gathering, synthesizing, and distributing information
	Virtual community	Creates and facilitates an online community. Frequently its members share a common interest and provide support to each other
	Whole of enterprise/government	Provides a single point of contact for the business customer, consolidating all the services provided by an organization (this model plays an important role in the public sector)
Rappa's (2000) taxonomy of business models	**Brokerage**	Encompasses online marketplaces in which buyers and sellers are brought together to facilitate transactions. Usually a broker charges a fee or commission for each transaction
	Advertising	Provides content or services mixed with advertising (e.g., portal, and Content-Targeted Advertising)
	Infomediary	Gathers data about producers, products, consumers, and their habits. This information can be sell/used to assist buyers/sellers in understanding a given market
	Merchant	Encloses wholesalers and retailers of goods and services. Their sales may be made based on list prices or through auction (e.g., virtual merchant, click and mortar)
	Manufacturer (direct)	Uses Internet diffusion capabilities to allow a manufacturer to reach buyers directly and thereby reduce intermediaries (e.g., purchase and lease)
	Affiliate	Supply purchase opportunities by offering financial incentives to affiliate partners. The affiliates provide purchase-point-click-through to the merchant (e.g., pay-per-click)
	Community	Relies on users' participation to achieve its viability. Revenues can be based on advertising, subscriptions or contributions
	Subscription	Charges the users with a periodic fee (for instance, daily, monthly or annual) to subscribe a service
	Utility	Employs a metering usage. Unlike subscriber services, it is based on actual usage rates. For instance, some Internet service providers charge customers for connection minutes

Description of business model classifications

Osterwalder and Pigneur's (2010) patterns	**Unbundling**	Separates three types of businesses: "customer relationships", "product innovation", and "infrastructure" into separate entities (they may co-exist within a single organization)
	Long tail	Provides a wide range of niche products, each of which sells quite occasionally. It is supported by strong-platforms to make content readily available
	Multi-sided platforms	Merges two or more distinct, but interdependent, groups of customers. It depends on the extent it attracts more users
	Free	Offers free services to at least one customer segment. Non-paying customers are financed by others
	Open	Open the companies' research process and promotes collaborations with outside partners
Johnson's (2010) business model analogies	**Affinity club**	Offers exclusive membership advantages. It exchanges royalties for access to a larger customer base
	Brokerage	Promotes transactions between buyers and sellers. It charges a fee on successful transactions
	Bundling	Simplifies complex transactions by packing together related products
	Cell phone	Sells a service through multiple plans (different prices, dependent on the type of use)
	Crowd sourcing	Outsources content construction to a broad group in exchange for access to other users' content
	Disintermediation	Delivers directly a product or a service to customers, removing usual intermediaries
	Fractionalization	Allows users to pay just a part of the product or service, but get full use if necessary
	Freemium	Offers basic services for free, but charges premium ones
	Leasing	Makes expensive products affordable by having the customer rent rather than buy them
	Low-touch	Provides low-cost, self-service version in place of a traditionally high-end offering
	Negative operating cycle	Maintains low inventory and receives item payment up front
	Pay-as-you-go	Charges customers for metered services according to actual usage rates
	Razor/blades	Offers expensive items for low or no cost, creating tied market for consumables
	Reverse auction	Sets a ceiling price and allows bidding downward
	Reverse razor/blades	Provides low-cost or free consumables to sell high-margin products
	Product-to-service	Sells the services that a product performs, rather than sell the product outright
	Standardization	Provides low-cost standardized solutions instead of high-cost customized ones
	Subscription club	Charges a subscription fee to gain access to a product or service
	User communities	Manages a network, granting revenue through membership fees or advertisements

Rappa (2000), following his own definition of business model, extended Timmers' work and suggested a comprehensive list of forty-one different business models (new or reinvented due to the Internet), grouped in nine main categories. His proposal emphasizes the economic dimension and the company's position in the value chain. It was based on extensive case studies and "keen observation". However, as this author admits, the achieved classification is neither definitive, nor exhaustive. Rappa (2000) also notes the possibility to combine each category in a variety of ways, similar to the use of Lego bricks, which opens space to the creation of hybrid solutions. Linder and Cantrell (2000), in turn, claim that in some cases people talk about business models when, in fact, they mean only parts of it and that this perception is translated to their classification schemes. For instance, in their opinion, Rappa's (2000) online auction and community models are respectively a pricing mechanism and a customer relationship. To contribute to the clarification of the field, Linder and Cantrell (2000) present their own proposal, which lists and categorizes business models by centering on two main dimensions: core profit making activity and its relative position on the price/value continuum.

The typology presented by Weill and Vitale (2001) attempted to carry out a more exhaustive classification. The authors supported their research on fifty case studies of traditional firms that implemented electronic business models. Their analysis was guided by four principles: strategic objectives, sources of revenue, critical success factors, and core competences, which led them to the identification of eight "atomic e-business models". Each one is considerably different from the others in terms of the criteria established by the authors in their definitions (Lambert, 2006). Weill and Vitale's (2001) proposal presents similarities with the work developed by Rappa (2000). Both are guided by their authors' definition of business model and supported by case studies. Moreover, the two consider that firms' initiatives can be represented by pure atomic business models or by combining them in multiple ways. They also stress the importance of taking into account the synergies and conflicts between "atomic e-business models" (e.g., to use simultaneously "content provider" and "direct-to-consumer" may give rise to divergences that can compromise established aims).

Tapscott et al. (2000) proposed a value centered taxonomy, which defines the elementary characteristics of five basic types of business webs. They differ in their degree of economic control (self-organizing vs. hierarchical) and degree of value integration (low vs. high). In these business webs, each company concentrates itself on its core competences, but the value creation takes place in the network, not in a single company. Figure 3 depicts this taxonomy.

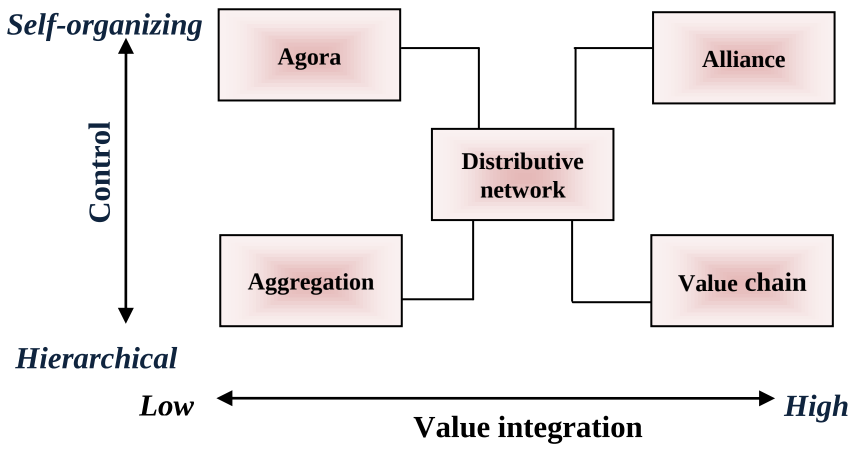


Figure 3: Business web taxonomy

Source: Adapted from Tapscott et al. (2000).

The five basic types of business webs are Tapscott et al. (2000):

- Agora - illustrates markets where buyers and sellers meet to freely negotiate item values. It facilitates exchanges between buyers and sellers (e.g., as in eBay). Since sellers may offer a wide and often unpredictable variety and quantity of goods, its value integration is low.
- Aggregation – addresses scenarios where one company leads, positioning itself as a value-adding intermediary between producers and customers. It takes the responsibility for selecting items, targeting market segments, setting prices, and ensuring fulfillment (e.g., Amazon). It offers a variety of items and its value integration is low.
- Value Chain – represents a context provider that structures and directs the business web to produce a highly integrated value proposition (e.g., Cisco).
- Alliance - strives for high value integration without hierarchical control. Its participants collaborate and share experiences. Alliances usually depend on rules that govern interactions, the behavior of the participants, and the determination of value.
- Distributive Network - serves the other types of business webs by allocating and delivering goods – whether information, objects, money, or resources - from providers to users. The more customers use the network, the more value it provides to them.

Weil et al. (2005) decided to analyze the effect of applying a particular business model to the financial performance of companies to derive implications. To answer this challenge, they developed and applied a typology to classify the business models of the top 1000 firms in the US economy in the year 2000, based on two fundamental dimensions. The first considers what types of rights are being sold and comprises the following scenarios: creator (buys raw materials or components from suppliers and then transforms or assembles them to create a product); distributor (buys a product and resells essentially the same product to someone else); landlord (sells the right to use an asset, but not to own it); and broker (facilitates sales by matching potential buyers and sellers). The second dimension accounts for the type of assets involved. Four important classifications are distinguished: physical, financial, intangible, and human. The outcome shows that some business models do indeed perform better than others, thereby demonstrating the value of the business model at use. For instance, in most cases the right to use assets was more profitable and more highly valued by the market than selling ownership of assets. This information emphasizes the relevance of choosing the correct business model.

As we have shown, in the early 2000s the classification of business models received several contributions. Despite the evident lack of consensus, the existing ones provided an awareness of possible business models and improved the perception of possible typologies. The descriptive nature of the developed work made it easy to comprehend and transmit the meaning and relevance of a business model. Furthermore, the achieved range of classifications aided to discuss and perceive their scenarios, supporting the business model design and innovation. In the following years, the research focal point has changed from developing taxonomies that enlist and describe various generic business models to identifying their different constituent components and the relationships among them. However, a decade later, Osterwalder and Pigneur (2010) and Johnson (2010) underlined the role that can be assigned to classifications as jump-starts of a creative business model process of discussion. They used them as patterns that can be explored in different contexts to converge into a solution able to pursue the aims of a particular business model. Both authors reflect the already detected diversity of classifications, the current trend to explore collaborations among business partners, the offering of basic services for free and the charge of premium ones, the use of subscriptions or fees, and advertisement. The ability to explore business models for monetizing Internet applications has also been considered a point of interest for scholars (Zott et al., 2011). A clear and timely example of the relevance of this topic is the difficulty Facebook is facing in convincing the markets of its ability to monetize almost a billion users (Ortutay, 2012).

Business model classification is a challenge for future research. It can help to disclose possible business variables fundamental to perform their categorization and aid in the development of a framework to compare the different business models, as it was performed in Weill et al. (2005). However, a general classification, a holistic and exhaustive taxonomy is yet to be defined (Pateli and Giaglis, 2004, Keen and Qureshi, 2006, Lambert, 2006). Most of the available proposals are unstructured and appear to be developed in an ad hoc manner, with no direct reference to the business model attributes proposed by the respective authors (Lambert, 2003). For instance, Bamburry (1998) described some classifications using an unstructured narrative. Others meet the requirements of a systematically constructed business model typology, suitable as basis for deductive, empirical research, based on a small number of variables. This is the case of Timmers (1998), Linder and Cantrell (2000), and Tapscott et al. (2000), who use two criteria, while Weill and Vitale (2005), for example, use four.

This field does not share common guidelines and its evolution is not sufficiently integrated and supported by the outcomes of other business model sub-domains. Due to its fuzziness, it is difficult to establish a criterion to determine when a particular business model is indeed a category. Business model definitions, as well as business model components and frameworks can aid to define aspects to consider in this decision. In the next section, we will address components.

2.1.3 Conceptual models and their components

Business model components, also known as “functions”, “elements”, “attributes”, or “building blocks” are closely related to the business model definitions and describe what a business model is made off. Their identification and detailed description shed some light on how they can be assembled in new arrangements and support the creation and development of original business models. Similar to business model classifications, they can assist managers in understanding the scenarios of their companies and possible alternatives.

The components identified in the literature do not only differ with respect to their abstraction level, but also in their scope and elaboration. Some consist of an enumerated list, while others evolved to conceptual models that address the relationships among components. To outline the research progress we will start to discuss the enumerated lists.

As in the above sub-domains, we detected a lack of consensus on the key components to address in a business model. For instance, Morris et al. (2005) identified twenty-four, while in a similar study Shafer et al. (2005) pointed out forty-two. Despite the differences, there is one overarching aspect that unifies the available proposals - each component can be viewed as a building block of the companies’ business plans for creating value. Next, we will discuss some of the most popular proposals published in reference journals or books, or with specific characteristics of interest for our research.

2.1.3.1 Enumerated lists and representations

Due to the wide acceptance of Timmers’ (1998) business model definition, several authors used it to identify business model components or as a foundation to develop their own definitions, which subsequently led to their proposals. We chose three contributions to illustrate this line of research: Papakiriakopoulos et al. (2001), Stanoevska-Slabeva and Hoegg (2005), and Stähler (2002), which we detail in Table 4. All have in common the adoption of a network-centric perspective.

Papakiriakopoulos et al. (2001) proposed four components: coordination, cooperation-competition, customer value, and core competences. These authors focused on identifying actors and understanding their relationships, as well as on coordination mechanisms to manage the dependencies between the business resources and activities. In this work, a relevant role is also assigned to customers, since its authors intend to consider how their needs influence the products and services provided by the network. In a similar way, Petrovic et al. (2001), and Stanoevska-Slabeva and Hoegg (2005) also proposed components to address customers’ characteristics and expectations. These components integrate marketing specific issues into the business model frameworks in order to support the selection of a suitable environment for the business model operations. Furthermore, they aid in the management of customer relationships (how to reach, serve, and maintain their presence).

By following an integrative perspective, Stähler (2002) identified four components that are a direct outcome of the questions introduced by this author in his business model definition (Table

4). Like Timmers (1998), Stähler (2002) defined components for products or services, value architecture, and the revenue model. In addition, he identified a fourth component: "value proposition". This author was one of the first to assign the designation "value proposition" to the value an entity gains from the business model (it concentrates on the customer needs, but also on the requirements of network peers). In turn, the work developed by Stanoevska-Slabeva and Hoegg (2005) revealed less explored perspectives of the business models. Supported by the outcomes of their work on generic components for mobile data services, they added to Timmers'(1998) proposal two components: "medium" and "societal environment". The former establishes a direct connection with technological resources that can be used by the business model, while the latter reflects its external influences.

Afuah and Tucci (2003) also addressed a value-centered perspective (Table 4), but in a line of research different from the one adopted by Timmers (1998). They emphasized monetary aspects, which led them to define components, such as revenue sources (it clarifies questions like "Where do the dollars come from?"), sustainability (takes into account what a firm must do to sustain any advantage), and cost structure (expresses the relationships between revenues and the costs of generating those revenues). According to the authors, the success of the business model depends not only on these key components, but also on how well the links among them work. They also portrayed technology and the environment of a firm as influencing factors, which urges organizations to be always ready to be reinvented, highlighting their changeability.

In a similar vein, Mahadevan (2000) and Rayport and Jaworski (2004) identified components such as value proposition, revenue generation, market segments, and resource systems. The same happened with Chesbrough and Rosenbloom (2002). However, these latter authors made a clear connection with strategy, proposing a component to address the firm's competitiveness. Due to clear similarities with aspects of the proposals presented above and their proximity to strategy (which is outside the scope of our work), these contributions were not described in detail.

Table 4: Business model components

Author	Description of business model components	
Papakiriakopoulo et al. (2001)	**Coordination**	Manages dependencies that reflect the interconnections between the resources and the activities
	Cooperation - competition	Describes the relationships among companies which can be of competition, or cooperation, or both at the same time
	Customer value	Aligns the business model with the market and customers needs
	Core competence	Identifies the specific skills and cognitive traits directed towards the attainment of the highest possible levels of customer satisfaction
Stähler (2002)	**Value proposition**	Describes the benefits and therefore the value a customer or a value partner gains from the business model
	Product or service	Is the link between the firm and the customer
	Value architecture	Delineates the value chain, the economic agents that participate in the value creation and their roles. Comprises aspects like market design, and internal and external value architecture
	Revenue model	Describes the basis and the sources of income for the firm
Stanoevska-Slabeva and Hoegg (2005)	**Product/Service**	Comprises the actual design of a product or service, the way it is perceived and consumed by the customers and the value proposition for the customer
	Medium	Defines possibilities for interaction via certain media among the stakeholders of a business model from a technical point of view
	Customers	Refers to the target groups of an offered product or service and to their needs
	Value chain	Reflects all the players involved in the creation of value and their relationships
	Financial flow	Describes the financial transactions among different stakeholders
	Flow of goods and services	Describes the stakeholders' activities that are essential for the creation of the product or service
	Societal environment	Reflects relevant outside influences on a business model (e.g., legal aspects and competitive situation)
Afuah and Tucci (2003)	**Customer value**	Differentiates the offered value from competitors' value
	Scope	Approaches the market segments to which the value is being offered and the range of services that embody that value
	Pricing	Regards the pricing strategy
	Revenue sources	Determines the revenue sources
	Connected activities	The activities a firm must perform to underpin the value it offers
	Implementation	Consists in carrying out the decisions made in the different elements
	Capabilities	It covers resources, competences, and competitive advantage
	Sustainability	Addresses what a firm must do to sustain any advantage
	Cost structure	Expresses the relationships between revenues and the costs of generating those revenues

Prior to Afuah's and Tucci's (2003) suggestion to explore the relationships among business model components, Hamel (2000) and Alt and Zimmermann (2001) had already abandoned the idea of perceiving the components as "shopping lists" and started to focus their research on this topic.

Hamel (2000) claimed that to achieve innovation it is necessary to think business models through a broader perspective. To answer this requirement, the author proposed a business model framework that emphasizes the role of market issues and technological progresses in the improvement of existing business models, or in the creation of new ones. The framework combines the internal and external analysis of the firm's value creation and consists of four major components (Figure 4): 1 - Customer interface (interaction with customers); 2 - Core strategy (essence of how the firm choose to compete); 3 - Strategic resources (unique firm specific resources); and 4 - Value network (the network that surrounds the firm, complementing and amplifying its own resources). These four components were subsequently decomposed and linked through three "bridges" (Hamel 2002, p. 73):

- Customer benefits – defines the benefits offered to the customers;
- Configuration – refers to the linkages among competences, assets, and processes, as well as how these linkages are managed;
- Company boundaries – concerns the decisions that have been made about what the firm does and what it contracts out to the value network.

Hamel (2000) identified four factors to think about when determining a business profit potential: efficiency to deliver customer benefits, business uniqueness, degree of fit among the business elements, and extent to which the business is able to exploit profit boosters.

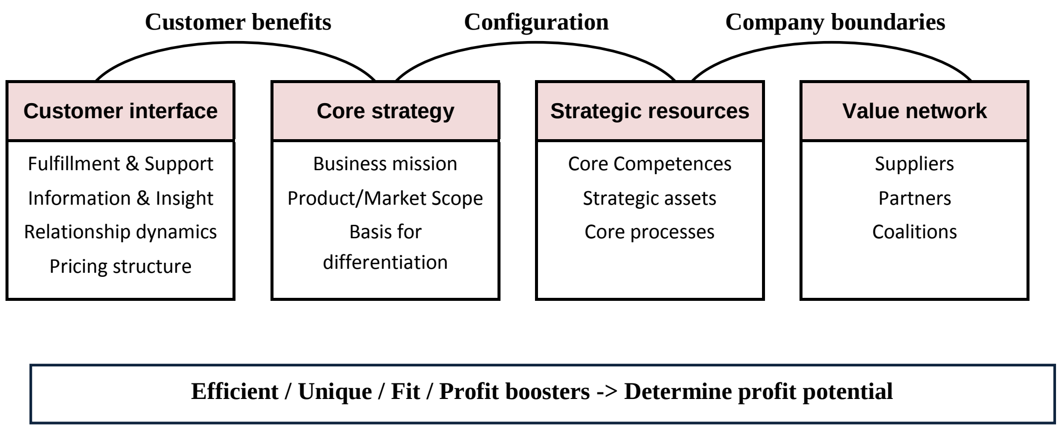


Figure 4: Hamel's components of the business model

Source: Adapted from Hamel (2000).

In turn, Alt and Zimmermann (2001) found a common denominator in the literature that allowed them to derive some generic elements. Their proposal consists of two main dimensions:

- The horizontal dimension concerns four inward components of the business model: mission (develops a high-level understanding of the overall vision of the business, its strategic goals, and its bundle of products, which the authors named value propositions), structure (determines which roles and agents constitute a business community), processes (provides a more detailed view on the two previews elements), and revenues (analyzes sources of revenue and investments).
- The vertical dimension includes external pressures that are able to influence business implementation such as market trends, regulation, and technology.

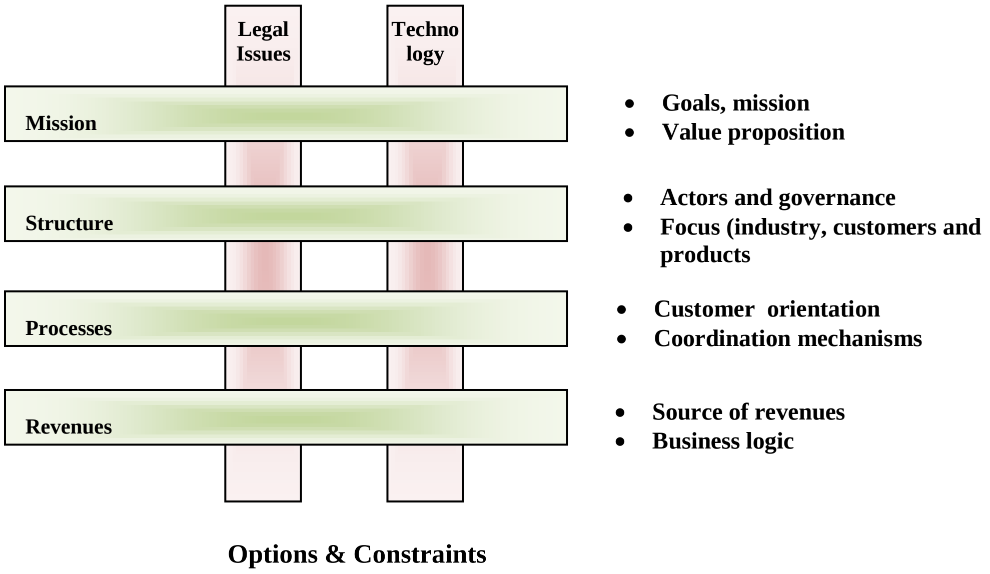


Figure 5: Alt and Zimmermann’s generic elements of business models

Source: Adapted from Alt and Zimmermann (2001).

With the aim of making the interactions among components more explicit and enhance the common understanding of business ideas, some researchers adopted a graphical representation with similarities with graph theory. This is the case of Linder and Cantrell (2000), who focused their proposal in the description of an organization’s core logic for creating value. Their approach starts by pointing out all sources of revenue, as well the value propositions that attract and retain each of them. Then, it identifies the key factors that enable the value propositions or result from them. The relationships among these components are depicted through directed arrows in Figure 6, which illustrates the business model of a company that sells office products online. The company intends to provide its products at dealer cost, attracting small and mid-sized firms accustomed to paying a twenty-five to forty percent mark-up and offer them interesting services to build volume. Increased amounts enable the company to negotiate purchase discounts with suppliers of wholesalers which, along with a lean cost structure, give the firm its profit.

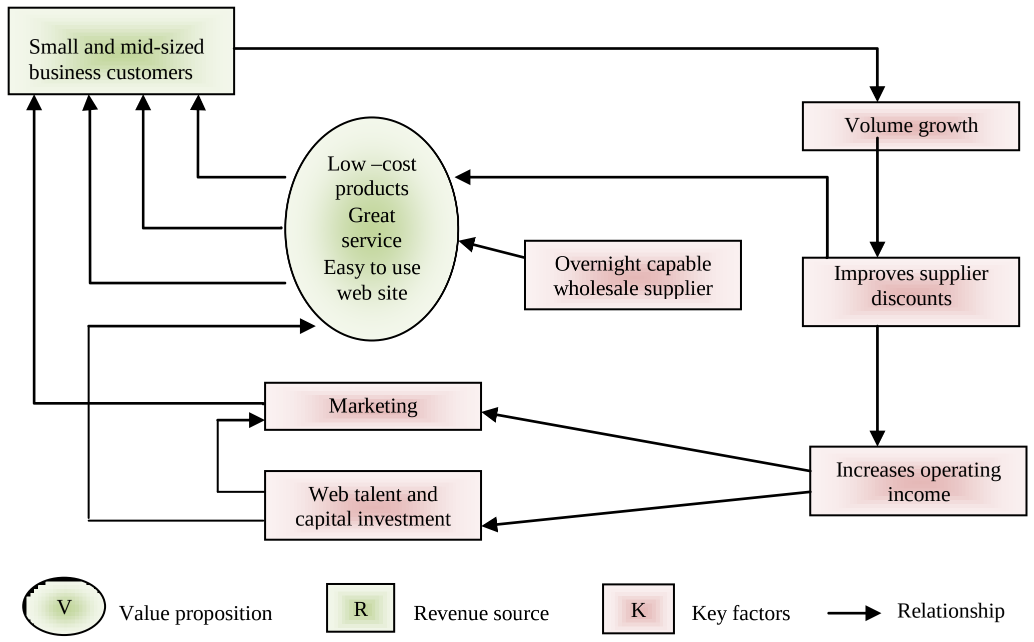


Figure 6: Linder and Cantrell outlined operating business model

Source: Adapted from Linder and Cantrell (2000).

Weill and Vitale (2001) also developed a diagram technique called e-business model schematics to represent their eight atomic e-business models (Table 3). This technique highlights three critical elements of the business models: 1 - Participants (firms of interest, customers, suppliers and allies); 2 - Relationships - either electronic or primary relationships; 3 - Flows (money, information, product or services). These aspects are abstractions that can be applied to a wide range of business scenarios, disclosing problematic situations, highlighting the business model core competences, detailing the stakeholders, and unveiling the existing relationships. Figure 7 presents an example. The full-service financial provider may be a bank, a financial adviser, or any other trusted institution. It acts as an ally for the e-broker by enhancing demand for the e-broker's services and presents an integrated offering that includes its own financial services and those that are sourced, including e-broking and insurance services. Albeit using third-party service providers, the full-service financial provider owns and maintains the customer relationship.

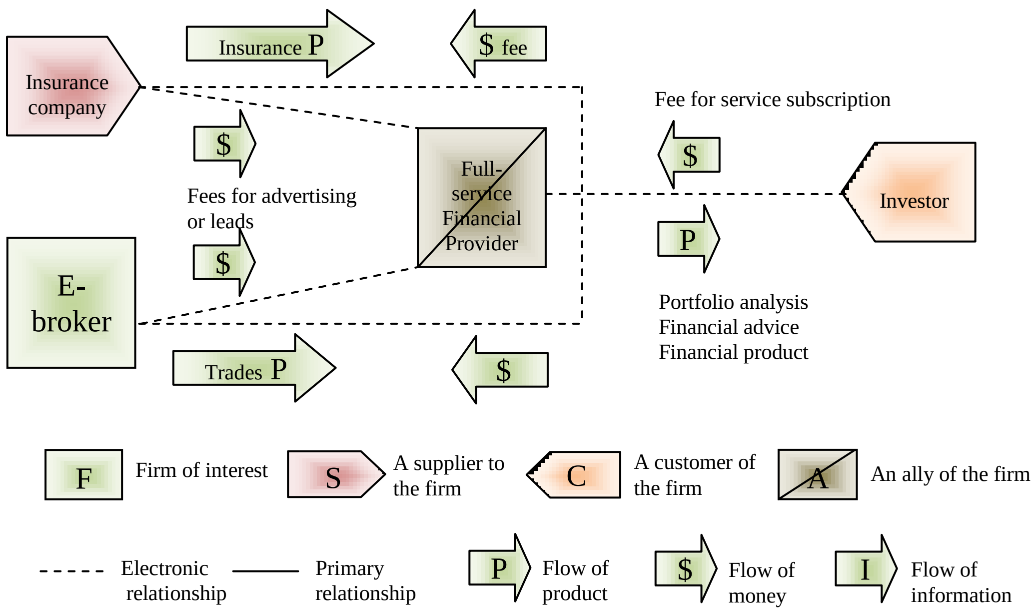


Figure 7: Example of an e-business model schematic: e-brokering with full-service financial provider

Source: Adapted from Weill and Vitale (2001).

In turn, Tapscott et al. (2000) developed value maps for depicting how a business model operates, or will operate, in the future. Their proposal identifies all key classes of participants (e.g., partners, customers, and suppliers) and describes the complex web in which participants exchange value. The networks engage in two orders of value exchange:

- Tangible exchanges of goods, services, and revenues: includes all exchanges involving contracts and invoices, return receipt of orders, request for proposals, confirmations or payment. Knowledge products or services that directly generate revenue, or that are expected (contractual) and paid as part of a service or good (e.g., reports) are also considered tangible exchanges.
- Intangible exchanges of benefits and knowledge: exchanges of value that go beyond the services that are accounted for in traditional financial measures (not contractual) such as sense of community, customer loyalty, image enhancement, reputation or co-branding opportunities. Knowledge exchanges are also considered intangible (for example, strategic information, planning knowledge, process knowledge, technical know-how, collaborative design, and policy development).

Figure 8 illustrates the Cisco's value map. The ovals represent the nodes of the network (participants or roles) and the arrows show the direction of the flows. The company delegates physical production and other non-core functions to partners around the world. It concentrates itself on increasing the value proposition of its services (Tapscott et al., 2000).

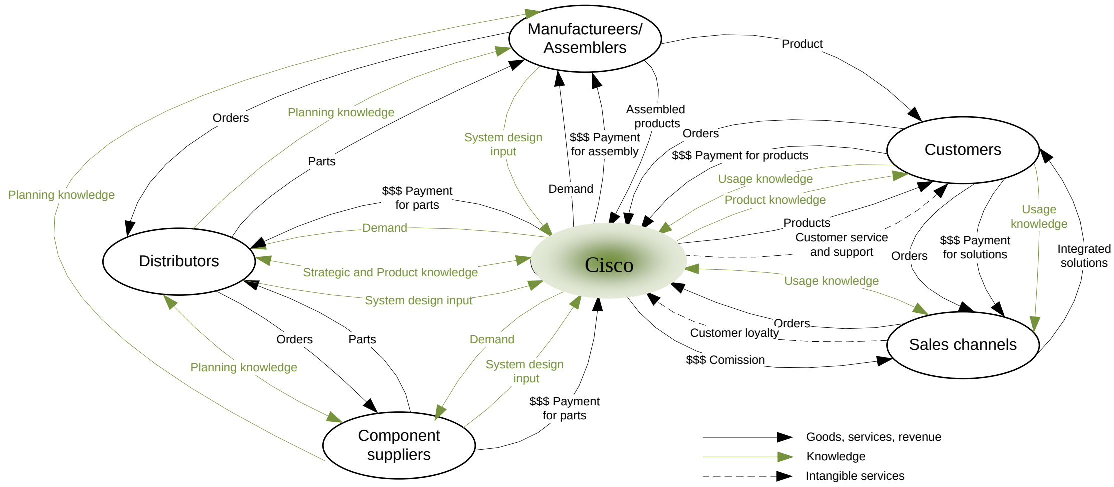


Figure 8: Cisco's value map

Source: Adapted from Tapscott et al., (2000).

The idea that intangible assets influence the network behavior is gaining wide acceptance. For instance, reputation can go beyond brand to include the assets of social citizenship or environmental responsibility (Allee, 2000, Henderson and Sethi, 2006). The participants of a network can trade favors, or regard in their decisions factors like the prestige that can be obtained through the network or forged relationships of loyalty. Due to the importance that this type of flows might possess, it is critical to understand how they can be taken into account when analyzing and designing business models.

The three previous representations proposed by Linder and Cantrell (2000), Weill and Vitale (2001), and Tapscott et al., (2000) are strongly related to the business model definitions proposed by their authors (introduced in section 2.1.1). They cover aspects such as provided value propositions, obtained revenue sources, business model's participants, and their interactions. The depiction of the identified components strengthens the importance of reflecting the business model's role of aggregator and aids to explore its relationships with extra details (when compared with the former list in Table 4). It is possible to observe the direction of the flows and detail the type of flows in question. Taking into account intangible flows creates new opportunities to research business models (e.g., new types of negotiation mechanism or alternative evaluation processes).

2.1.3.2 Reference models and ontologies

As previously shown, in the beginning of 2000s the diversity of proposed business models definitions, classifications, and components nullified the researchers' attempts to clear confusion (Pateli and Giaglis, 2003). One reason for this persistent diversity has been the tendency for different authors to "reinvent the wheel" and ignore existing research (Nagle and Golden, 2007). As a result, the business model domain moved forward at a much slower pace than it should (Osterwalder et al., 2005). Around the year 2005, researchers followed a different approach and started to synthesize the large quantities of past research, see for instance (Morris et al., 2005, Shafer et al., 2005, Osterwalder et al., 2005). Even though these works presented clear distinctions, the common aspects addressed by them were a clear indicator that the field was acquiring an extra level of maturity, which has been promoting the evolution of less explored business model sub-domains of research. Next, we will discuss these works of synthesis, as well as their outcomes.

Morris et al. (2005) analyzed the existing literature on business models from an a cross-theoretical perspective and combined it with theoretical underpinnings from fields like business strategy (Porter, 1985, 1996), resource-based theory (Barney, 1991), strategic network theory (Jarillo, 1993), cooperative strategy (Dyer and Singh, 1998), and Schumpeterian theory (Schumpeter, 1934). Figure 9 presents their proposal, which addresses strategic issues and operational effectiveness.

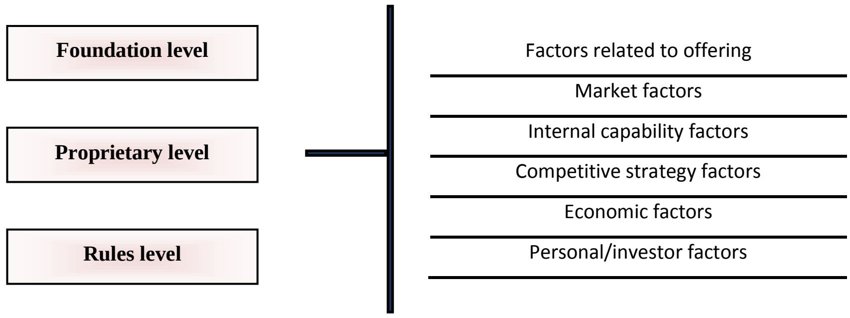


Figure 9: Levels of decision making

Source: Adapted from (Morris et al., 2005).

The developed work consists of three increasing levels of decision making, termed “foundation”, “proprietary”, and “rules” (the items in the rectangles) that reveal the different managerial purposes of the model. Further, each level addresses six common basic decision areas. The “foundation” level makes generic decisions based on business model characteristics (e.g., growth opportunities and possible partnerships). It enables comparisons across different venture types (e.g., subsistence, income, growth, and speculation) and supports the recognition of universal models. The “proprietary” level promotes the development of unique combinations among decision variables that may result in marketplace advantage. It represents an architectural configuration focused on internal activities that enable the creation of value in each of the six components. The “rules” level delineates guiding principles regarding the execution of decisions made at the two preceding levels. The authors related these three levels to the progression of the business model development. The foundation level may evolve progressively towards a more detailed model at the proprietary and rules levels. The dependencies among the levels also imply links between components, which can also be influenced by the specific characteristics of the different types of ventures carried out.

In a similar study, Shafer et al. (2005) reviewed business model definitions in established publications during the period 1998-2002. They catalogued the components cited at least twice and disclosed four main categories (Figure 10): strategic choices, the value network, creating value, and capturing value.

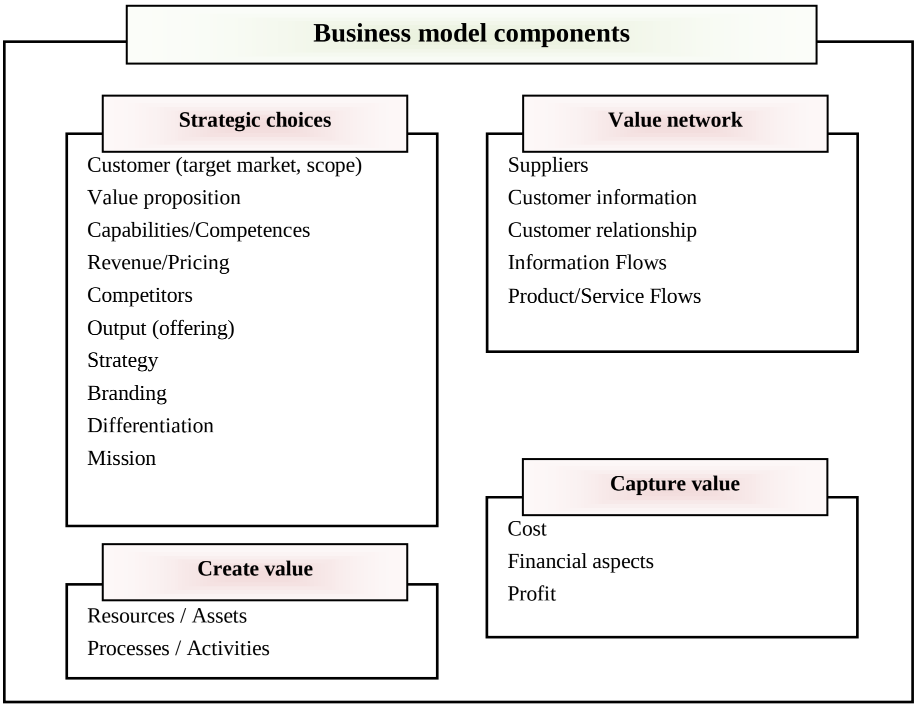


Figure 10: Categories of business model components

Source: Adapted from Shafer et al. (2005).

Shafer et al. (2005), as Morris et al. (Morris et al., 2005), used business models to analyze and communicate performed strategic choices. However, they also assigned a prominent role to the notion of value. According to these authors, firms create value by doing things in ways that distinguish them from the competition and the business model should reflect how to achieve that differentiation. They also emphasize that, in the end, companies must make money to survive. Therefore, their viability depends both on the value they create and on the way they capture it, and thus, on how they generate profit. Like Hamel (2000), Shafer et al. (2005) argue that these actions occur within a value network that is influenced by a specific context. The research performed around 2005 pointed out a tendency to take into account the business model network and its context.

The last two proposals aimed at disclosing business model elements but, as we already mentioned, it is fundamental to define the relationships among them. Next, we will discuss three proposals that contributed to this research topic: the e3-value ontology, the Business Model Ontology/Canvas, and the STOF framework.

The e3-value ontology

The e3-value ontology models networked value constellations and attempts to enhance business-information technology alignment (Gordijn and Akkermans, 2001a, Gordijn, 2002). It explores innovative business ideas intensively supported by information technology, based on principles from requirements engineering and conceptual modeling. Under this scope, its authors underline the role that business models can have as the first step in the requirement analysis of their supporting information systems, smoothing the transition to their development.

Through the e3-value, its authors intended to achieve an agreement and a common understanding of a business idea among a wide group of stakeholders (a constellation of enterprises and final clients) that jointly create, distribute, and consume value. Furthermore, they also planned to enable the validation of the business model in terms of its economic feasibility. The developed proposal took on Porter's value chain (Porter, 1985) and elaborated on the Internet impact on business models, which opened up the chance to move from linear cross-organizational cooperation to more complex networked value constellations. This research perspective was also influenced by the work of Normann and Ramírez (1993) on value constellations and on their perception that nowadays organizations work mainly in a web configuration, rather than in a linear sequence of value adding elements.

To achieve the mentioned goals, the ontology provides modeling constructs for representing and analyzing a network of enterprises that exchanges elements of economic value with each other. We present in Figure 11 the class diagram of the ontology (represented in Unified Modeling Language).

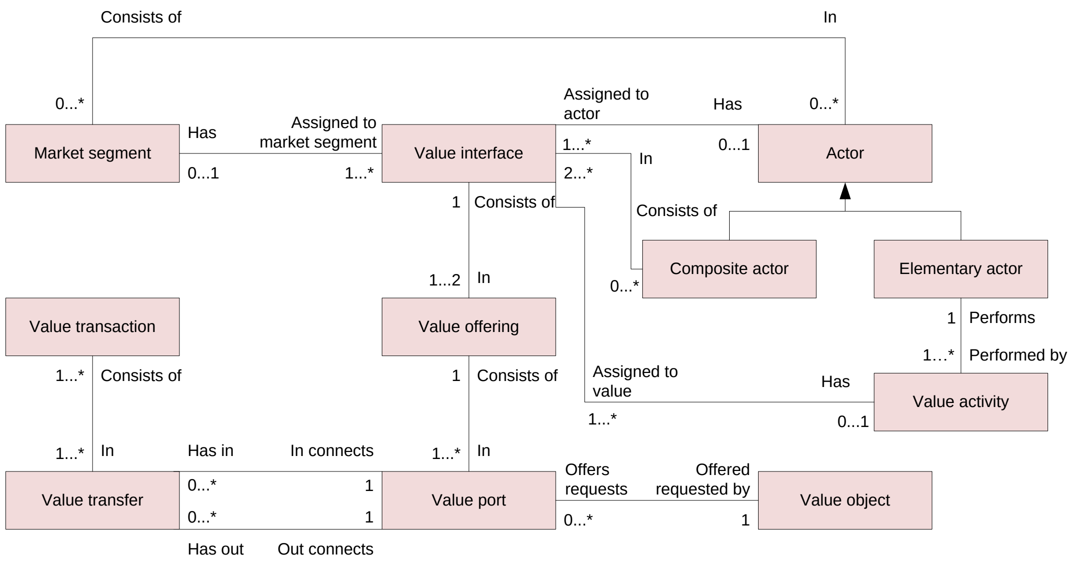


Figure 11: Concepts and relations of e3-value ontology

Source: Gordjin (2002).

Next, we provide a brief description of the e3-value modeling constructs:

- An actor is perceived by his or her environment as an economically independent entity (e.g., an enterprise) that exchanges value objects, such as services, money, or even experiences. These value objects are of economic value for at least one actor.
- A market segment breaks actors into segments that share common properties and assign economic value to an object equally.

- Value ports are used to provide or request value objects to or from other actors. The concept of port enables an abstraction from the internal business processes.
- The actors can have one or more value interfaces, grouping value ports and showing economic reciprocity. Actors are only willing to offer something to someone else, if they receive adequate compensation in return.
- A value transfer is used to connect two value ports with each other. It represents one or more potential trades of value objects. A value transaction groups value transfers that all should happen, or none at all. The e3-value ontology assumes the existence of an ideal world where economic reciprocity is always maintained, i.e., if an actor provides an object of value to its environment, it requests another in return, with equivalent value.
- A value activity illustrates the assignment of value activities, which are assumed to yield profit or increase economic value for the performing actor(s).
- A dependency path is used to reason about the number of value exchanges in an e3-value model and consists of dependency nodes and connections. A dependency node can be a consumer need, an "and/or" forks or joins, or a boundary element (denotes the end of value exchanges on the path). A dependency connection links dependency nodes and value interfaces to satisfy a particular aim.

The e3-value ontology uses a lightweight approach and a graphical syntax to answer the usual short development time of e-business initiatives and the need to promote and enhance the common understanding of different stakeholders involved (Gordijn and Akkermans, 2003). Figure 12 uses the e3-value to describe interactions among the actors: "Shopper", "Store", "Wholesaler" and "Manufacturer". The Shopper is a market segment, consisting of a number of individual purchasers. By following the path, it is possible to observe that the Manufacturer performs an activity (for instance, packing a product) to deliver a required Good to a Wholesaler, that subsequently will send it to a Store. This good is used in a value transfer to satisfy Shopper needs. In the opposite direction, money is used in a value transfer to pay the rendered services (Kort and Gordijn, 2008).

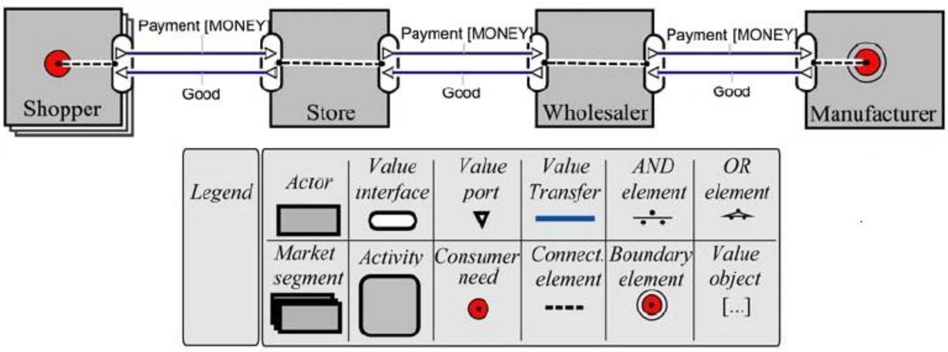


Figure 12: Educational e3-value example

Source: Kort and Gordijn (2008).

Given an e3-value model with its scenario paths, it is possible to observe which value objects are exchanged by actors. According to Gordjin (2002), this description allows the creation of profitability sheets on a per actor basis, which provide indications about the potential profitability of the scenario under study. To carry out this assessment, two types of actors are involved: enterprises and end-consumers. Since enterprises strive to maximize their profits, when calculating enterprise profit sheets, e3-value ontology only takes into account value objects denoting money. However, the main aim of end-consumers is not profit, but to satisfy their needs, which introduces an extra complexity not covered in the e3-value ontology. It is necessary to understand how an end-consumer assigns economic value, especially to non-money objects. This assignment is a very subjective task (Holbrook, 1999), and adds that this subjectivity extends itself to enterprises, since they may negotiate items, whose value can be very difficult to quantify.

Over time, the e3-value ontology has been extended and has originated the e3-family depicted in Figure 13. In addition to the aspects initially covered, the e3-family offers additional viewpoints (Gordijn et al., 2009): e3-strategy (models strategic motivations associated with environmental pressures), e3-service (addresses services, in particular e-services, bridging the customer and supplier perspective), e3-control (configures solutions that may fight fraudulent behavior and is grounded in inter-organizational auditing and control). Transversally to the described layers, two others were idealized: e3-alignment and e3-domain. The e3-alignment intends to assist in keeping all e3-family models consistent, aligning their different concerns. If problems or concerns are found in one perspective, the others are refined to regard the identified issues. In turn, the e3-domain includes knowledge about a specific industry to enable the use of the ontology by practitioners.

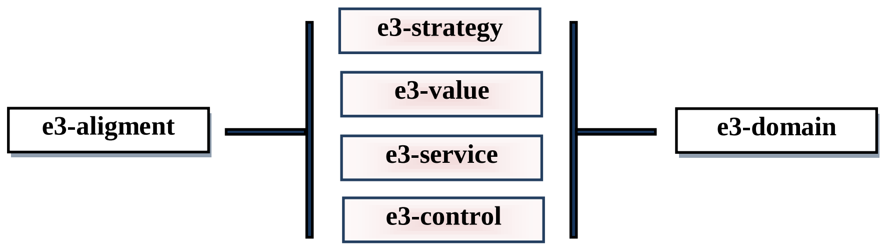


Figure 13: e3-family, designing network analysis

Source: Adapted from Kartseva (2008).

The e3-family had as one of its purposes to reason about the contextual socio-economical aspects of e-services. More recently, the literature has been focused on automatically generating e3-value instance models and on dynamic service bundling. To understand the business model context and integrate its influences in the value model remains an open issue.

The e3-ontology, especially the e3-value layer, promotes a common understanding of a business idea. It portrays all the actors of the value constellation, the interchanged value propositions, and the performed activities. It also provides an indication of the involved economic values. Nonetheless, e3-value constraint on the economic reciprocity assumes the existence of an ideal environment, excluding inappropriate behaviors.

Business Model Ontology

The Business Model Ontology improves communication about a company's business model, providing guidelines to better formulate, comprehend, manipulate, share, and develop business ideas. It was developed by Osterwalder and Pigneur (2002), whose work was influenced by the Balanced Scorecard (Kaplan and Maxwell, 1994). The latter identifies four perspectives that should be followed to conduct successful businesses and for each encourages the answer to a question, as detailed next: 1 - Customer ("How the customers see us?"); 2 - Innovation and learning ("How can we continue to improve and create value?"); 3 - Internal ("What must we excel at?"); 4 - Financial ("How can we continue to improve and create value?"). Through their translation to the business model, Osterwalder and Pigneur (2002) identified four areas that a business model should address:

- Product - what the company offers to their customers;
- Customer interface – who are the customers, how they are reached, and how the relationships are built;
- Infrastructure management – how the company performs infrastructural or logistical issues, with whom, and as what kind of network enterprise;
- Financial aspects – What are the company revenues, its cost and its pricing.

Osterwalder and Pigneur (2002) combined the described perspectives with the business model components identified through an exhaustive survey in the literature. They excluded the ones related to competition and to business model implementation since, in their perspective, these components have connections with the business model but are not an internal part of it. Through the obtained outcome, they detailed the identified four pillars into the nine business model building blocks outlined in Table 5. They form the basis for the Business Model Ontology.

Table 5: Components of the Business Model Ontology

Grouping	Business model building block	
Product	**Value proposition**	Overall view of a organization's bundle of products
Customer interface	**Target customer**	Segments of customers an organization wants to offer value
	Distribution channel	Various means of an organization to get in touch with its customers
	Relationship	Kind of links an organization establishes between itself and its different customer segments
Infrastructure management	**Value configuration**	Arrangement of activities and resources
	Core capability	The competences needed to execute the business model
	Partner network	Network of cooperative agreements with other organizations
Financial aspects	**Cost structure**	Monetary consequences of employing a business model
	Revenue model	Revenue flows through which an organization makes money

Figure 14 presents the Business Model Ontology and describes how its components relate to each other. The light lilac rectangles represent the components, the black line describes relationships, and the arrows specify what composes a component.

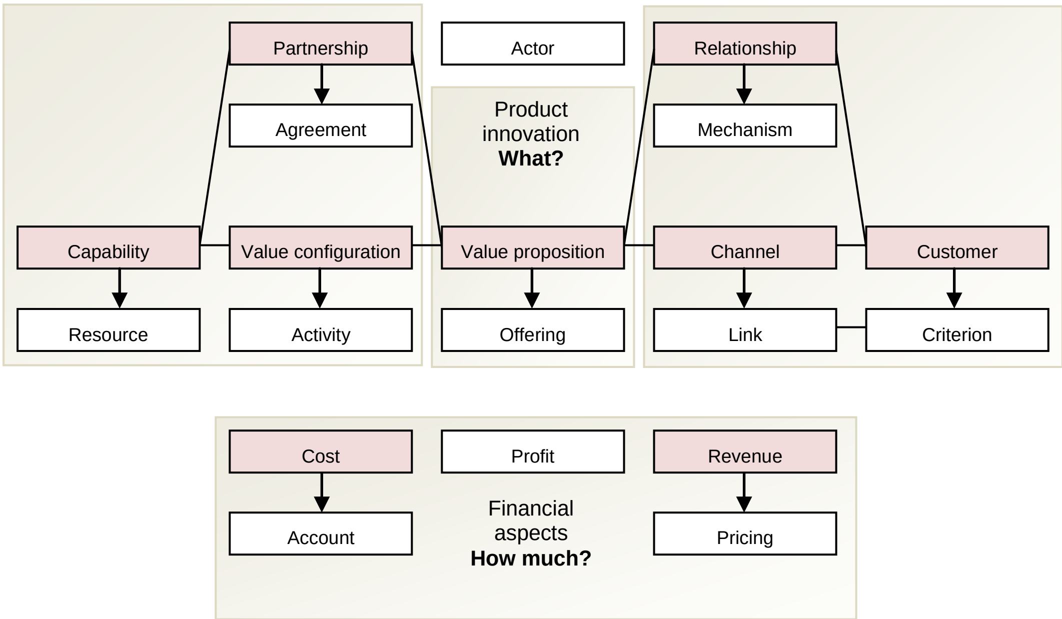


Figure 14: Business Model Ontology

Source: Adapted from Osterwalder (2004).

The value proposition component is composed by a set of one-or-more offerings(s) and it is characterized by five attributes: 1 - Description (explains the value proposition); 2 - Reasoning (justifies why the value proposition could be beneficial); 3- Life cycle (studies the value proposition life cycle); 4 - Value level (measures an offer to analyze its utility for the customer); 5 - Price level (compares the value proposition price to the competitors). In turn, the customer relationship group covers the entire customer's buying cycle (customers' awareness, their evaluation of the company's value proposition, the moment of purchase, and after sales). It considers the nature of customers' relationships in three different stages: acquiring new customers, retaining existing ones, and selling them additional value propositions. The infrastructure management describes the value system configuration that delivers the value propositions and was inspired by the e3-value ontology (Gordjin, 2002). It comprises the value activity configuration of the firms, the established relationships to carry out a project, and the available capabilities (in-house and the ones acquired through partnerships). Finally, the financial aspects determine the firm's profit-or-loss making logic and are transversal to all the others.

The Business Model Ontology later led to the development of a handy tool, which its authors designated by Business Model Canvas (Osterwalder and Pigneur, 2010). According to them, by visually depicting a business model it is possible to transform tacit assumptions into explicit knowledge. They claim that it is difficult to understand a model without sketching it out. Therefore, these authors resort to techniques like visual thinking, prototyping, storytelling and scenarios to develop their tool. Visual thinking was considered indispensable and consists in using visual artifacts like pictures, Post-it notes, or drawings. Figure 15 shows how the Business Model Canvas uses a provided template that should be printed out on a large surface and put on a wall to allow researchers or practitioners to stick or write their ideas. They can address a particular component, dependencies among components, or the business model as a whole. The Business Model Canvas only describes the business logic of a single firm.

Figure 15: Business Model Canvas template

Source: Osterwalder and Pigneur (2010).

The Business model ontology helps to construct a common understanding of a business model. It promotes communication and discussion among stakeholders, supports the decision making process, and facilitates change and innovation.

STOF framework

When comparing different business model definitions and frameworks, Faber et al. (2003) realized that the developed work provided a rather limited perspective on cross-company collaboration in complex value networks. The majority of the available proposals addressed single companies and did not pay much attention to the linkages between variables of different business model topics (e.g., organizational and financial) or to cross-company collaborations (Bouwman et al., 2005a). The researchers also noticed the need to develop methods for defining and designing business model services. To address these limitations, they searched for common components that could be used in networked business model, in particular for innovative mobile ICTs services. The result was the STOF framework that stands for Service, Technology, Organization, and Finance domains (Figure 16), which integrates the identified components.

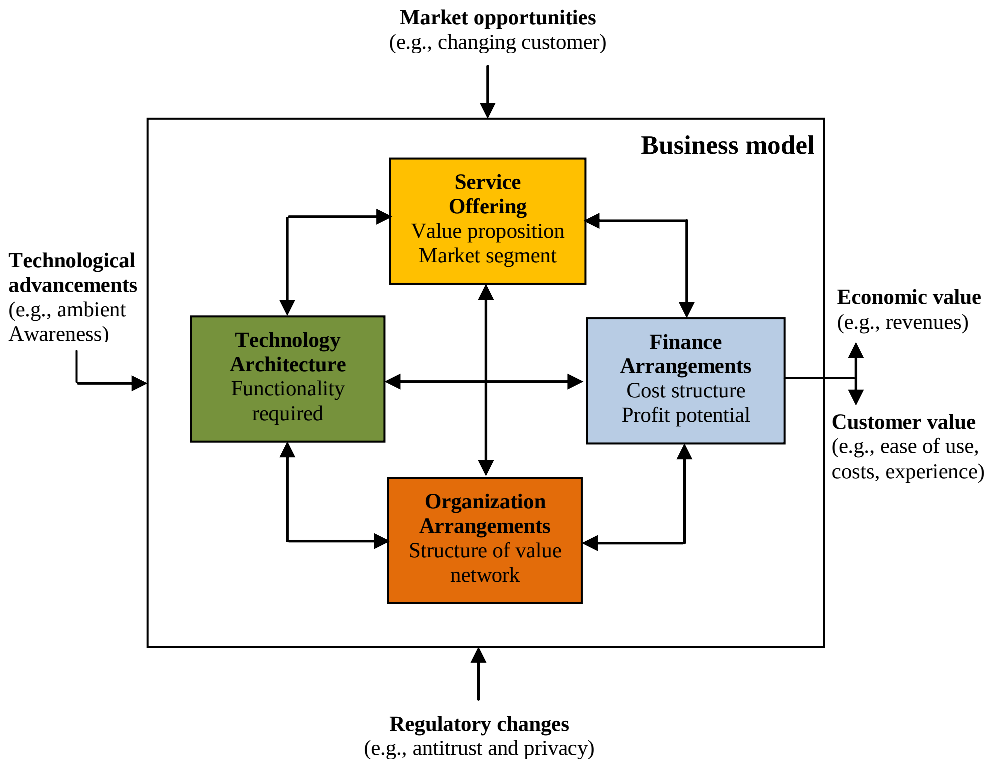


Figure 16: STOF business model framework

Source: Adapted from Faber et al. (2004).

The components are interrelated and do not function independently. The topics covered by each of them are (Bouwman et al., 2008b):

- Service component: describes the value proposition (added value of a service offering) and the market segment at which the offering is aimed;
- Technology component: details how the service offering can be carried out in a technical perspective. It is based on the requirements of the service component;
- Organization component: describes the structure of the multi-actor value network required to create and distribute the service offering (includes resources and

capabilities). It also considers the focal firm's position within this value network (e.g., its goals);

- Finance component: describes the way a value network intends to generate revenues from a particular service offering and how risks, investments and revenues are divided among the various actors in a value network.

For each component, the authors defined critical design issues that may influence their performance (variables perceived as relevant to the business model). Next, we provide examples for the introduced components: 1 - Service (targeting, creating value elements, and customer retention); 2 - Technology (security, quality of service, and system integration); 3 - Organization (partner selection, network openness, and network governance); and 4 - Finance (pricing, valuation of contributions and benefits, and division of costs and revenues). Based on the established Critical Design Issues, the authors of the framework derived critical success factors that cover a limit number of areas with impact on the business model viability (Bouwman et al., 2008a, Reuver et al., 2008). As an example, Figure 17 gives an overview of the critical success factors implicated in the customer value and of the critical design issues that ground them.

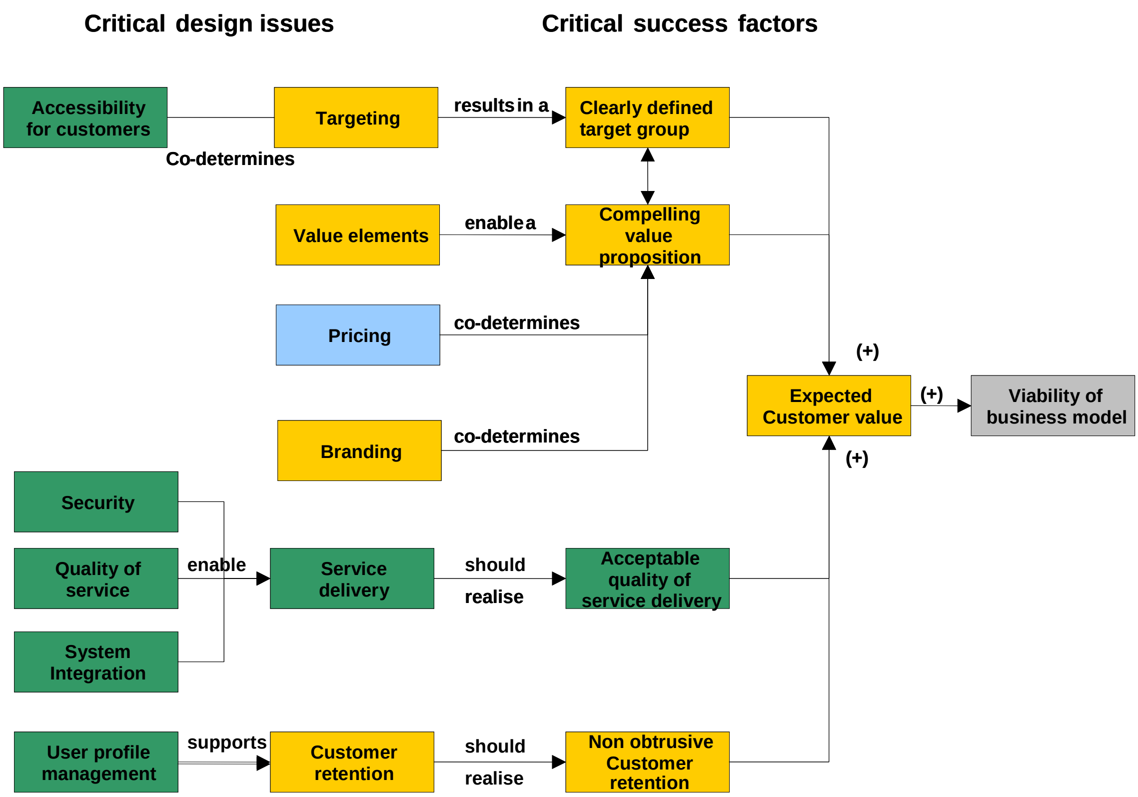


Figure 17: STOF critical design issues and critical success factors for creating customer value

Source: Adapted from Bouwman et al. (2008a).

According to the authors of the STOF framework, the need to connect and balance design choices in different domains to obtain the highest value outcome for customers and partners is one of the most challenging aspects when analyzing and designing business models. For instance, what makes sense from a technical point of view may not seem interesting from a financial perspective. These authors also underline the relevance in addressing collaborations in value networks and recognize that a business has to take into account its contextual influences such as technological, market trends, and regulatory impact.

Through this section, we showed that business model components have evolved from “shopping lists” to building blocks, reference models, and ontologies (Gordijn et al., 2005). In this process, we detected significant similarities between the available proposals, but also noteworthy differences. Next, we will detail our analysis, which is focused on the preceding five proposals, since they comprise a detailed bibliographic analysis of the previously developed work.

Applying one of the most widely used set of criteria for evaluating a model: 1 – simplicity; 2 – accuracy; and 3 generalisability (Miller and Dess, 1993), we note that the components identified in the e3-value ontology (Gordijn and Akkermans, 2001b), the Business Model Ontology (Osterwalder, 2004), and the STOF framework (Faber et al., 2003) seem more developed. Shafer et al. (2005) present twenty subcomponents, in comparison to a more simplified four components in the STOF framework, nine subcomponents in the Business Model Ontology, and ten in the e3-value ontology. In a different approach, Morris et al. (2005) address essentially strategy issues, falling outside the aim of identifying inward business model components.

Gordijn et al. (2005) compared the e3-value ontology and the Business Model Ontology. These authors argue that both share common purposes in their aim of improving the design, understanding, management and analysis of business models. For instance, both use a semi-formal approach rather than a strict formal one to promote the participation of stakeholders that do not understand formal models very well. Furthermore, the concept of value proposition and the arrangements of activities and resources are common denominators. Similarly, the STOF framework is also constituted by components that overlap with Business Model Ontology and e3-value (e.g., the ones that cover value propositions, market features, financial issues, and organizational arrangements).

There are points of contact between the three proposals. Yet, their scope of analysis is different. While the Business Model Ontology addresses the business logic of a specific firm, the other two adopted a wider perspective by addressing inter-organizational business models. Their differences are propitious to the establishment of complementarities in the field of a firm inter-operability. While the e3-value and the STOF framework provide insights on the network value exchanges, the Business Model Ontology contributes with detailed data on firm’s partnerships, customers’ relationships, core capabilities, and distribution channels. Therefore, it is possible to establish a connection between an inter-organizational business model framework and the Business Model Ontology applied to the individual business model of the entities that compose the network.

Other differences can be pointed out. The e3-value assigns a higher importance to the economic evaluation of the value propositions in the business model. Its semi-formal representation links value models to business process models and provides a bridge between the business model, requirements engineering, and systems development fields. This conceptualization in different levels was also adopted in (Morris et al., 2005). In turn, the STOF framework assigns a special attention to technological factors that promote the interaction among the elements of the partnerships established in complex value networks, and between the network and its customers. Therefore, the role of technology, and its relationships with the other domains, is explicitly made. The STOF framework also discusses critical success factors, which are also covered by Weill and Vitale (2001). The Business Model Canvas (the newer version of the Business Model Ontology) clearly emphasizes its use as a designing tool for promoting innovation.

2.1.4 Adoption factors

Factors like geography, policy, culture, ethics, organizational issues, religion, power relationships, and conflicts influence, directly or indirectly, the perception, development, and adoption of business models. The study of the impact of these factors may be used as a crucial element to disclose guidelines that aid to achieve the viability, stability, and success in business models. Nevertheless, only a smaller segment of the research community pursues this direction (Pateli and Giaglis, 2004). An example is the work developed by Pouloudi et al. (2003). They proposed a framework to study how key social factors could influence the adoption of business models and grouped them in seven general categories: region/geography, culture, legal/regulatory/policy, economic, ethical, professional, social networks, and social structure. According to this framework, those categories are not independent aspects of a business model. They complement more traditional perspectives such as provided services, revenues, organizational arrangements, resources, and technological architecture.

McGann and Lyytinen (2002) also tried to understand the dynamics of adoption and diffusion that take place in relation to business models. These researchers focused their work on two topics: technological infrastructure and environmental factors. They claim that technology provides integration for purposes of business transaction and information sharing. In their opinion, technological solutions, depending on their cost and maturity, can be key factors in determining the success of the business models, whose activities they support. Examples of key enabling solutions are: payment systems and credit card processing technology. When addressing the impact of environmental factors on business adoption, these researchers split their study into institutional and external diffusion issues. The former covers features that exercise influence and regulation over entities (e.g., regulatory frameworks for business taxation, privacy principles, and online security policies). The latter either serve to push the model towards success by providing needed catalysts for diffusion (e.g., venture capital and technical competence) or propel the business model by creating a favorable environment for its adoption (e.g., computer literacy). The core argument of these researchers is the need to scrutinize not only the business practice, but also the models it is built upon.

The discussed topics strengthened our decision to study the environment where business models operate, due to its influence on how business models are perceived, communicated, developed, adopted, and evaluated. By taking into account the context of the business model when specifying the high-level requirements of its underlying technological solutions, we can promote the adoption of the business model and of its technological support.

2.1.5 Business models evaluation

For the ones responsible for business model decision-making, it is valuable to acquire indications that could help them in their assessment (e.g., when considering an innovative business model or alternative ones). The emergence of this domain was impelled by researchers who developed detailed descriptions of business model taxonomies and components, such as Hamel (2000), Weill and Vitale (2001), and Afuah and Tucci (2003). By breaking down business models and separately analyzing its components, these researchers created favorable conditions to perform evaluations. Next, we will present some of the work developed in this domain.

Hamel (2000) presented an approach grounded in the business models components he had identified (Figure 4, p. 32). This author proposed four evaluation criteria that address: 1 - Efficiency (the value customers place on the delivered benefits must exceed their production costs); 2 - Uniqueness (the originality of the business model); 3 - Fit (components' suitability to work together; and 4 - Profit boosters (aspects that improve the business model success, for instance network effects and customer lock-in). Weill and Vitale (2001) also proposed an evaluation based on their "atomic e-business model" (section 2.1.2, p. 27), in which the identified components are assessed according to strategic objectives of the business initiative (sources of revenue or value, critical success factors, and core competences). In addition, these authors explore areas of potential synergy and conflict among the components.

The solution proposed by Afuah and Tucci (2003) is driven by financial indicators. In their opinion, the best way to evaluate a business model is to compare its profitability to that of its competitors. Their evaluation of the business model performance consists of three levels. The first includes profitability measures (e.g., comparison of a firm's profitability to that of other players using measures such as earnings and cash flows). The second concerns profitability prediction, which confronts a firm's profit margins, revenue market share, and revenue growth rate with those of its competitors. The third provides benchmark questions for each of the business model components defined by these researchers. For instance, "Is customer value distinct from that competitor?", "Is the growth rate of market segments high?", or "Are margins and market shares in each revenue source high?".

Gordijn (2002), by including in the e3-value ontology a detailed technique to assign economic value to the exchanged items between actors, took a step further in the evaluation of business models. The author's proposal takes into account incoming and outgoing money flows and identifies factors that play a role in the creation of their value. Then, it assigns them economic value using measurable quantities such as the number of occurrences of consumer needs, the size of a market segment, the valuation of the items transferred between the actors, and investments. The actors involved are also asked to assign economic value to the value objects they obtain and to the ones they provide. The sum of the assigned values is analyzed to verify gains acquired and efforts demanded of the business model actors. According to Gordijn (2002), distinct scenarios to disclose possible inconsistencies or future problems should be evaluated.

As recognized by Gordijn et al. (2009), the e3-value assumes an ideal world, in which all parties provide a reciprocal object (e.g. money) if they obtain another object (e.g. a good). This perspective reveals a partial vision of reality, which limits its application, especially in complex scenarios such as networked business models. However, it underlines the capability to reason about profitability and to perform a sensitivity analysis. Furthermore, it allows varying critical factors and contributes to a better understanding of the business idea.

The e3-value evaluation technique follows the assumption that it is possible to assign economic value to the items exchanged among the actors. However, this raises several problems. For instance, when Disney World, in Florida, offers admission discounts to locals, its managers know that, for a reduced price, locals are more likely to come regularly. But tourists will probably come only once, whether it is cheap or expensive (Harford, 2006). The ticket provides the same service and it is rated differently, depending on its customers. According to the circumstances, economic evaluation can change rapidly and can be appraised differently depending on who is performing it.

The e3-value ontology allows the development of individual evaluations, including the perspectives of the different actors that constitute the business model. Nevertheless, this solution does not solve the difficulties in expressing value in monetary terms. For example, doctors at Ditan Hospital in Beijing claimed that a combination of various Chinese herbs had a 75 percent cure rate in the 117 patients treated there for swine flu. The recovery period was shorter than in patients who received Tamiflu and the daily cost of the herbal remedy was approximately 12 yuan ($1.486 EUR), which was lower when compared to Tamiflu treatment at 56 yuan ($6.91 EUR), (Shlian, 2009). In this particular scenario, we can question what monetary value to assign knowledge in Traditional Chinese Medicine.

The majority of the proposed criteria are driven by the assignment of financial values to business model flows and activities, whose precision is in many cases very difficult and in some cases impossible to establish (Pateli and Giaglis, 2004). However, we can witness an evolutionary act that comprises a clear expansion of the factors under analysis. There is a shift to models that consider broader issues, leading the evaluation of business model beyond financial aspects and towards the assessment of value creation.

Amit and Zott (2001) highlighted the difference between a business model and a revenue model. While the former mainly refers to value creation, the latter is focused on value appropriation. According to these authors, value refers to the total value created for all parties involved in a business model. The analysis of these researchers revealed four interrelated value drivers: efficiency, complementarities, lock-in, and novelty, which can be used as value creation sources, but also as value evaluation dimensions (Johansson and Mollstedt, 2006). Amit and Zott’s (2001) proposal was based on the value chain framework (Porter, 1985), the theory of creative destruction (Schumpeter, 1942), the resource-based view (Barney, 1991), the strategic network theory (Gulati et al., 2000), and transaction cost economics (Williamson, 1975).

In Amit and Zott's (2001) proposal, efficiency refers to transaction efficiency, which increases when transactions are cheaper, faster, or of better quality than the average. Business models can also create value through complementarities, which occurs whenever a bundle of goods provides more value than the total separate value of each single good. Another source of value creation is the extent to which a business model is able to lock-in customers and strategic partners. It can be enhanced through topics like customization, affiliate programs, loyalty programs, transaction safety, and reputation built on transaction history. In turn, novelty consists in new ways to structure transactions, connecting parties, diminishing inefficiencies, capturing needs, and creating new business scenarios.

By focusing on transactions, the value drivers have the necessary flexibility to be applied to different industries and stages of venture maturity. However, its application in the field is not detailed by its authors (e.g., it is unclear how to handle financial issues or how to deal with collaborations among firms). The evaluation performed in the light of Amit and Zott's (2001) proposal consists in assigning the identified value propositions to one of the value drivers and discuss their performance based on information acquired about the business model (e.g., on interviews, documents, or inquiries). Johansson and Mollstedt (2006) and Lassila (2006) provide examples.

In their updated version of the Business Model Ontology, the Business Model Canvas, Osterwalder and Pigneur (2010) propose a tool to evaluate the business model environment, as well as the business model itself. The environmental analysis considers the context in which the business models are conceived or modified. It comprises several items grouped in four main areas: 1 - Market forces (addresses topics like market segments, needs and demands, and revenue attractiveness; 2 - Industry forces (for example, stakeholders, competitors, and substitute products and services); 3 - Key trends (such as technology, regulatory, societal, and cultural trends); and 4 - Macro-economic forces (for instance, economical infrastructure and commodities). In turn, the evaluation of the business model combines the nine components of the Business Model Canvas with the SWOT analysis (Andrews, 1971) in two types of assessment. The first identifies the strengths and weaknesses of the business model as a whole to evaluate its overall integrity (uses all the nine components). The second applies the SWOT analysis to each component in detail. The Business Model Canvas provides sets of questions to help incite the assessment of strengths, weaknesses, opportunities, and threats.

The evaluation proposed by Osterwalder and Pigneur (2010) is focused in analyzing individual components. Furthermore, the two types of assessment of the business model show an overlap concerning strengths and weaknesses. Even though the authors provide a list of predetermined questions, these are generic and do not reflect the specificities of each business model scenario, and how those questions must be formalized and placed.

To conclude, we will present the evaluation dimension of the STOF framework, which balances the often conflicting strategic interests and requirements over the four STOF components (Bouwman et al., 2008b). In addition to a descriptive model, the STOF framework also provides a causal model to address success factors and critical design issues with impact on the balance of the business model and on its performance (Bouwman et al., 2008a). To detect critical design issues the framework was applied in the study of several cases (e.g., mobile entertainment services and mobile payment services). The acquired knowledge has been used to build causal frameworks. These frameworks address relationships among design variables within a particular component, or among different ones, as well as their implications on critical success factors that may affect the viability of the business model.

The method consists of four steps (Vos and Haaker, 2008):

- Step 1 “Quick Scan” - provides a rough sketch of the business model by answering questions with respect to the four components of the framework.
- Step 2 “Evaluation with critical success factors” - tests the potential success of the Quick Scan against identified critical success factors. The evaluation on the success factors determines which parts of the business model need to be elaborated.
- Step (3) Specification of critical design issues - refines the business model by specifying for each component its Critical Design Issues, which follow from the success factors and feed the design choices.

  Step 2 and 3 are conducted in an iterative process that may lead to amendments in the original business model design or to its cancellation. The first three steps possess an internal focus, i.e., the design of a service.
- Step (4) Robustness check - involves an internal evaluation focused on checking the relationships among the components and the receptivity towards the changes carried out. In addition, it also performs an external assessment on the robustness of the design (the ability to adapt to external occurrences).

A way to evaluate robustness is to ask what-if questions. The answers will provide insights on problematic relationships and uncertainties. An alternative solution was followed by Reuver et al. (2008), who decided to do it by testing causal relationships between design issues and success factors. They analyzed the results of a survey among 120 practitioners and experts in the mobile Internet service domain. The study allowed them to refine the design issues that should be addressed in this field and test the impact of organizational and financial design issues on a set of success factors (e.g., acceptable role division among actors, acceptable risks, and acceptable profitability) that explain the value captured by the organizations offering the service. These authors aim to provide companies with a list of design issues to address in order to achieve particular success factors. Managers and business model developers can use this knowledge to envision and improve their business models. The same research group (Bouwman et al., 2012) also proposes the use of scenario analysis to validate the strong and weak parts of business models. They called the practice business model stress testing.

The evaluation dimension of the STOF framework is mainly useful in early stages of innovation. It enables actors to explore and contemplate different ideas and options. The dependencies identified between design issues and business success factors that can affect business performance supported our decision of exploring this kind of dependencies in networked business models. The insights obtained with their identification and implications have potential to provide valuable hints for the resolution of possible problems or threats.

The discussed proposals underline the importance of performing evaluations that go beyond financial aspects. Furthermore, they show the relevance of disclosing influences and dependencies with impact on the business model, and the need to involve stakeholders in this process. Their perception towards possible decisions helps validate future decisions.

2.1.6 Change methodologies

To take advantage of opportunities, or simply stay in business, firms often have to reinvent it, before the surrounding conditions do it for them. Business models do not have a static nature. They depend on diverse factors and are influenced by several conditions. In face of new circumstances, firms may be forced to change and adapt their business models. The necessity to adjust them to new conditions is well established, but, unfortunately, the research available does not provide many clues on how to perform this task (Pateli and Giaglis, 2004).

Linder and Cantrell (2000) detected that besides the usual difficulties in putting changes into practice, executives had difficulties in classifying the type of required change. To organize the range of options available and support executives in their decisions, these authors identified the following four basic types of change models:

- Realization model - maximizes the returns from companies existing operating logic. It exploits the potential of current business models to promote their growth and profit. It covers, for instance, product line extensions, geographic expansion, and additional sales or service channels.
- Renewal model – is especially common among companies seeking to stay on top of the price/value curve. It depends on its revitalization to counteract natural competitive forces that drive down margins. It covers, for example, new service offerings, new brands, untouched markets, and new retailing formats.
- Extension model - expands business to cover new ground. It includes in the operating model of the companies new markets, products, and services. New business lines do not replace, but add to the existing operations.
- Journey model - takes a company to a new business model, but it moves deliberately and purposefully and never returns. For example, companies globalize and shift their value propositions to highlight their global reach and capability.

Following a different approach, Tapscott et al. (2000) explained how business models propositions can be structured using the concepts of disaggregation and re-aggregation. First, it is necessary to describe the current value proposition from the customer’s viewpoint (the person whose needs the business must meet) and disaggregate them with the aim of identifying business opportunities for improvements. Subsequently, the researchers apply creative design techniques to envision the business model, define the new value propositions, and re-aggregate them. In the same line of research, Gordijn and Akkermans (2003) defined a value model deconstruction and reconstruction process inspired by Timmers (1998), Evans and Wurster (2000), and Tapscott et al.

(2000). In this process, Gordijn and Akkermans (2003) de-assign activities from their performing actors, explore alternatives (different scenarios), and later re-assign the activities to their executing actors to help organizations adapt to their environment. To clarify the discussion between stakeholders, these authors split the process into two questions: 1 - Which value adding activities exist; and 2 - Which actors are willing to perform these activities.

Other proposals have been presented to consider change in business models, but have serious limitations. For instance, Petrovic, Kittl, and Teksten (2001) introduced a generic business model change methodology where the concept of mental models is central. According to the authors, to perform changes in an existing business model it is necessary to modify mental models of the elements involved in the changes, otherwise the improvements will only be successful in changing technological aspects or, at best, the processes. However, the proposal is generic and does not provide guidelines on how to apply it. Papakiriakopoulos et al. (2001) also proposed a four stage systematic method with the purpose of transforming a business model. However, their proposal responds to the need for changing its technological infrastructure, neglecting changes driven by a new market or business opportunities.

In certain contexts, business models can be extremely dynamic. If the business model already exists, it may be necessary to perform a continuous evaluation to adjust it to possible changes. Bouwman et al. (2012) proposed a business model roadmap – a plan that, grounded on intermediary steps, guides the development from an existing business model to a desired one. The roadmap is carried out at two levels of analysis. The first points out what should be changed to enable the new business model. The second addresses the activities that need to be carried out to enable the changes. The business model roadmap shows the relationships among the activities that must be executed to enable change and can be visualized through a graph that defines the relationships among the activities. In many cases, when the need of change occurs, managers have several possible alternative scenarios, which must be analyzed to discover the solution that better fits their aims (Bouwman et al., 2012). This approach had already been proposed by Gordjin (2002) and shows a clear connection between this research topic and the evaluation of business models.

Introducing change in a business model is a delicate task. It is necessary to perceive the need to change, revisit adopted options, and consider possible alternatives capable of responding to change (e.g., different goals, arrangements, and particular expectations of the involved people).

2.2 Business models and value networks

The value chain developed by Porter (1985) has been used to understand and analyze industries, particularly manufacturing (Peppard and Rylander, 2006). It consists in a set of interrelated generic activities common to a range of firms, which Porter (1985) distinguishes between primary and support. The former are directly involved in the firm’s offer and consequently in its value creation. They are grouped in five main domains: inbound logistics, operations, outbound logistics, marketing and sales, and service. The latter support the primary activities and help improve their effectiveness or efficiency. There are four main areas of support activities: infrastructure, human resource management, technological development, and procurement (Figure 18). The support activities are performed in parallel with the previous and potentially apply to each of them (Stabell and Fjeldstad, 1998). The margin in the arrow underlines the need to manage activities and their links for an organization to realize a profit margin.

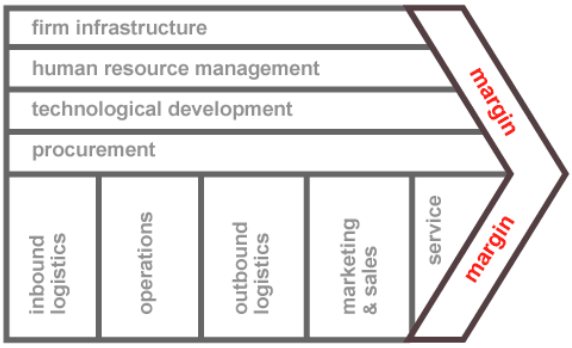


Figure 18: Porters' value chain

Source: Adapted from Porter (1985).

The value chain concept was extended beyond individual firms to supply chains and distribution networks. Porter (1985) designated this larger interconnected system of value chains the "value system", which includes the value chains of a firm's suppliers, the firm itself, the firm distribution channels, and the clients. Within a value system, a firm occupies a particular position, in which it adds value to its inputs, before passing them to the next element (Normann and Ramírez, 1993). When a firm intends to diagnose and improve its competitive advantage through the management of the value system of which it is a part, what remains the most important reference point is the organization, not the value system as an entity that co-creates value (Vanhaverbeke and Cloodt, 2006).

To clarify the potential of the value chain, Stabell and Fjeldstad (1998) supervised its application to more than two dozen firms, from a variety of industries. They found it well suited to describe and understand traditional manufacturing companies, but less appropriate to the analysis of activities in a number of service industries. With the technological advances and the use of the Internet as a business platform, this limitation has been emphasized. Ubiquitous connectivity and globalization changed the fundamental logic of value creation. They laid the basis to develop new value propositions that enclose new configurations and integration possibilities (Prahalad and Ramaswamy, 2004), in which firms are more properly viewed as connected to each other in multiple networks (Gulati et al., 2000). Amit and Zott (2001) also highlighted that innovative value proposals, supported by new forms of collaboration, go beyond the value that can be realized through the sequential configuration of the value chain.

To explore forms of collaboration, analysts need to pay attention not only to the behavior of a given company, but also to its universe of interactions. They should look upon the opportunities offered by the network concept and explore the advantages that can be gained by recognizing and fomenting interrelationships. This idea lies at the foundation of the “value constellations” introduced by Normann and Ramírez (1993), of “strategic networks” proposed by Gulati et al. (2000), of “value net model” suggested by Parolini (1999), and of “value networks” (Allee, 2008). According to these authors, the conduct and performance of firms can be better comprehended by examining the network of relationships in which firms are embedded. Its elements should look beyond the legally relevant demarcation of the firm and consider their context to, for example, enhance value propositions, extract value from the network setting, or disclose new ideas to bring and tie together different elements into a network. The established collaborations have the potential to create value that no single firm would be able to create alone. They offer the opportunity to explore and develop sustainable and innovative value propositions that can strengthen the network.

Even consumers are increasingly engaged in defining and creating value (Prahalad and Ramaswamy, 2004). It has been a shift in the role of the consumer “from isolated to connected, from unaware to informed, from passive to active” (Ibid., , p.4). In some particular situations, customers can even assume a more active participation, creating value for other customers, for instance through their contributions in forums (Stähler, 2002).

Value within network configurations is not created in sequential chain, but in complex constellations (Vanhaverbeke and Cloodt, 2006). Its elements provide services and products grounded on a complex configuration of relationships and activities. The established connections diminish the focus on individual organizations and underline the role of the items offered by the network. However, the joint effort will only be viable if the ones involved in their accomplishment are able to obtain benefits that can justify their participation. The value created and appropriated by the different players must be managed. Stand-alone analyses do not work when the success of a company depends on the collective satisfaction of other elements of the network (Iansiti and Levin, 2004). Normann and Ramírez (1993) and Parolini (1999) pointed out the need to resort to bargaining mechanisms to promote eventual adjustments to new circumstances and balance the network pursuit for joint value creation.

Network configurations also offer innovative ways to explore the firms’ resources. While the resource-based view has locked resources within a single firm (Barney, 1991), the network scenarios extends the firms’ frontiers. This allows them to access assets beyond their boundaries and combine them with their own solutions. When resources are the focus of analysis, the network structure and the established relationships are by themselves a valuable resource, since its complexity and value is, in most of the cases, very arduous to imitate or to substitute. A powerful and influential position in the network is usually associated with assets, resources or core competences required for the functioning of the network. Brandenburger and Stuart (1996) underlined the impact that network participants with bargaining power can have on the distribution of value.

Gulati et al. (2000) detailed the kind of ties established among the network elements to obtain clues on how these could obstruct movements, lead to possible locks, or encourage undesirable conducts. Their work revealed three types of relational characteristics that must be looked at to enhance the understanding of effects with impact on business models: network structure (overall pattern of relationships within which the network is embedded), network membership (its composition, for instance nodes, status, and resources), and tie modality (rules and norms that oversee the network). To test the potential of their proposal, the authors applied it to scenarios of study and used concepts from social network analysis to study the network proprieties (Gulati and Gargiulo, 1999). The investigation focused on the network structure, but did not consider aspects that could influence its stability and viability. It did not provide clues concerning preventive measures that could disclose alternative behaviors, as well as, conditions that could influence the maintenance or abandonment of the participants in the network.

Neither Normann and Ramírez (1993), nor Gulati et al. (2000) provided a technique to represent their networked configurations. Allee (2008) uses a representation similar to the value maps developed by Tapscott et al. (2000), see Figure 8. Parolini (1999), inspired by Porter (1985) and graph theory, maps value networks as an unbundled set of activities, which are linked by four possible flows: material, information, financial resources, or influence relationships. The activities are represented as nodes and the flows among them as arcs. Figure 19 presents a partial example.

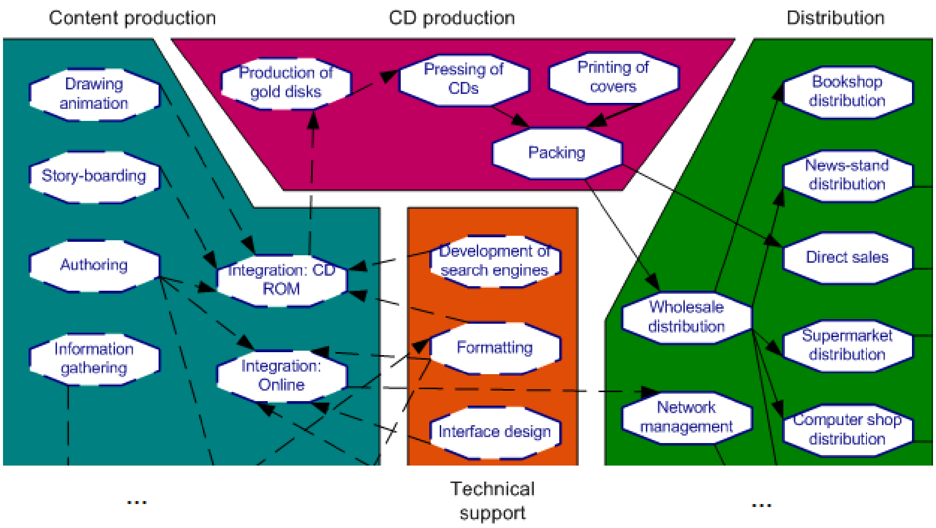


Figure 19: Generic value-creating system in the electronic publishing industry

Source: Adapted from Parolini (1999).

The network has a dynamic nature (Recuero, 2004) that results from factors associated with a large number of parties that must be taken into account, for instance, to satisfy a specific customer need or to address a temporary market opportunity. It is usually characterized as a decentralized environment, which includes different companies, often with different (and also conflicting) requirements, without a single point of authority for decision making (Wieringa et al., 2005). Even the border between the network and its external partners is not always easy to define, since networks often try to influence its environment and different stakeholder groups. Similarly, the social context in which firms are embedded influence the network relationships and its performance (Gulati et al., 2000, Parolini, 1999).

Networked business models are characterized by a large number of interconnected participants that depend on each other. In these complex configurations, it is imperative to continuously analyze the network relationships and obtain insights about problematic occurrences. We must integrate in our approach mechanisms that look for the best way to create, extend, and leverage value interdependencies among organizations. It is also critical to combine their individual expectations and the network overarching aims, which must be done by managing conflicting and cooperative interests.

2.3 Conclusion

To develop an approach to discuss, design, and evaluate business models, we reviewed the literature on this domain. The obtained insights aid us to perceive how we could use the outcomes of the business model study to specify the high-level requirements of its supporting information system. Below, we will present overall remarks on the reviewed literature (e.g., common denominators and existing limitations) and discuss topics to consider in the development of BIZ2BIS.

Our starting point was Timmers' (1998) definition, where he states that a business model is "an architecture for the product, service and information flows, including a description of the various actors and their roles; a description of the potential benefits for the various actors; and description of the sources of revenues", was our starting point. Afterwards, the literature review revealed the diversity of available proposals and its fragmentation over different disciplines such as information systems, strategy, and innovation. We chose the framework proposed by Pateli and Giaglis (2003, 2004), to organize our literature review. In this framework, a business model is decomposed into seven sub-domains: definitions, typologies, components, conceptual models, adoption factors, evaluation models, and change methodologies.

Initially, the research on business models was lacking in consensus. More recently, a convergence of ideas within the domain is obvious. The framework developed by Osterwalder et al. (2005) to synthesize past research is a clear example of an initial stage of maturity in the field. Its three categories: 1 - Business model concept (covers definitions and components); 2 - Types of business models (typologies); and 3 - Business model instances (descriptions and representations of real business models) almost directly matches the first four sub domains of Pateli and Giaglis (2004).

We reviewed business model definitions, typologies, and components to disclose the topics that we should consider. By analyzing definitions, we verified that most of them included concepts, such as value propositions, network partnerships, business architecture, business actors/roles/resources, or revenue sources. Our findings were later confirmed by the research performed by Al-Debei and Avison (2010), who suggested a unified business model conceptual model with four dimensions: value proposition, value architecture, value network, and value finance. This will be one of our working guidelines.

The typologies proposed in the literature showed us a tendency in perceiving different categories of business models as building blocks that can be combined in multiple ways. Their higher level of abstraction and descriptive nature make it easy to comprehend and discuss the business models available to answer an identified need. From the available proposals to visually represent business models, we identified relevant elements such as actors, value propositions, business flows (information, services, money, or intangibles), activities, and resources used in their execution. We share Allee's (2008) conviction that the benefits obtained through intangible forms of value can aid in disclosing motivations for people to engage in network's relationships. The extra knowledge gathered on intangible flows enhances network comprehension and provides extra hints to model, discuss, design, and evaluate the network. We also acknowledged the difficulty in evaluating all kinds of value propositions using an economic unit of measure. For instance, information and intangible flows have particular characteristics that result from the emergent proprieties of the network to which they belong and, depending on who assesses them, can be evaluated very differently.

Our literature review on components covered different perspectives and revealed a wealth of information. According to Gordijn et al. (2005), this research domain evolved from shopping lists (sometimes presented as part of definitions) to components as building blocks, reference models and ontologies. Authors like Shafer et al. (2005) and Osterwalder and Pigneur (2002) synthesized the literature at that time and identified regularly mentioned components. The ones identified by the latter researchers formed the basis for the Business Model Canvas (probably the most popular tool in the field), which allows researchers and practitioners to design business models. This tool creates a common space of discussion among actors from different domains and with distinct interests, which promotes discussion, communication, and innovation.

The Business Model Canvas is focused on individual companies, which makes it less usable in the study of networked business models. We do not intend to reduce the importance of studying a business model from the viewpoint of a single firm. However, the technological advances provided the basis to develop new value propositions that enclose new configurations. Therefore, it becomes critical to examine the network of relationships in which firms are embedded. This redefinition of value has been attracting the attention of scholars like Gordjin (2002), who developed the e3-value ontology to model networked value constellations. This ontology models value flows within a value network, depicts its supporting activities, and allows to model alternative scenarios. This author underlines the role of business models as the first step to obtain the high-level requirements of their supporting information systems, smoothing the transition to their development. In addition, by opening new research directions, it explores how value models can be linked to business process models.

Faber et al. (2003) also noted that the developed work on business model components provided a rather limited perspective on cross-company collaboration in complex value networks. Therefore, they searched for common components that could be used in networked business models (Faber et al., 2003, Bouwman et al., 2008c). Their work resulted in the development of the STOF framework, which describes the interdependencies between the four core domains, i.e.

service, technology, organization and finance, as well as a detailed description of each domain. They focused their design on ICTs-enabled services.

The above-mentioned approaches to design business models possessed an unquestionable relevance to our work. Their study allowed us to detect different perspectives and features to integrate in our approach to discuss, design, and evaluate business models in network configurations. They also contributed to stress the importance of establishing a connection point between the study of the business models and the specification of the high-level requirements of their information systems. Next, we will detail some of gathered guidelines used as structural elements in the conceptualization of our approach.

The Business Model Canvas and the e3-value ontology showed us the importance of using our approach as an effective communication tool to think about, discuss, innovate, and articulate a business model. Therefore, we decided to develop intuitive, simple to use, and supporting tools that could guide the promotion of collaborations with all the business model's participants and thus make it easier to follow and exploit every source of knowledge. We aim at diminishing the difficulty in accessing information and obtaining a comprehensive view of the business model, which is especially critical in early stages of the study, where information is scarce and hard to understand as a whole. The Business Model Canvas, the e3-value ontology, and the STOF framework also showed us the importance in defining a standardized outlined plan for the application of our approach in order to offer additional guarantees that its users do not overlook critical issues. With a well-defined structure, we also intend to avoid dependencies from their experience and personal judgments. Similar to these three proposals, we will also make use of alternative business model scenarios to encourage discussion, explore new opportunities, facilitate discussion on possible changes, and encourage innovation.

The Business Model Canvas pointed out components used to address "private" business models, which are also relevant in networked business models. This common denominator can be used to define links between the business model of a firm and the networks of inter-organizational business models to which that firm belongs. In turn, the e3-value ontology moved from linear cross-organizational cooperation to more complex networked value constellations. As in our focus of research, it explores business model ideas highly supported by information systems. The work developed in this ontology showed us the importance of understanding the value propositions exchanged among actors and the use of the performed activities as a link between those value propositions and the processes that support them. In our approach, we also decided to search and establish these links to translate the business models (including its social context) into requirements for the specification of its underlying information system.

The STOF framework details and designs services enabled by ICTs, determining their technical architecture, describing the structure of the multi-actor value networks used to support the offered services, and analyzing generated revenues. It takes into account critical design issues that can influence business model success, per and among different domains (service, technology, organization, and finance), to balance design choices. We also consider relevant to disclose the dependencies among these domains. However, we want to take a step forward. We want to integrate the network context and consequently the expectations of the network elements in this web of influences and dependencies. In addition, the STOF framework strengthened our choice to consider the concept of “service” as the connection point between two domains: business models and information systems.

The relevance that technological issues can possess on networked business models highlights the need to integrate them in our proposal. The e3-value ontology and the STOF framework have already contributed to explore the connections between business models study and their technological support. The former establishes a link between value propositions and their underlying business processes, while the latter details how the service offering can be carried out in a technical perspective. Despite the efforts of these approaches, the gap between business models and the development of their information systems has not yet been overcome. We intend to bridge the gap by developing an intermediate step that gathers the outcome of the analysis of the business models and of their contexts. This outcome should be understandable by all stakeholders and by the teams responsible for the technical development, or deployment. It must work as a point of contact, a bridge between distinct (but converging) interests, that brings together aspects as diverse as the technological illiteracy of the business model participants, their expectations, the business model value propositions, the performed activities, the regulatory trends, or the provided technological services. The intermediate step details the high-level requirements of the underlying information system in a business model driven way. It is thus possible to obtain, in an early stage, a revised and validated specification of its high-level requirements, strengthening its chances of a successful adoption.

When exploring the remaining sub-domains of the Pateli and Giaglis framework (2004), we became aware of open lines of research questions in three of them, namely adoption factors, change methodologies, and business model evaluation. There were no indications on how to address social factors in the development, adoption, or modification of real-world business models. Furthermore, the available proposals to evaluate business models were mainly focused on financial flows that resulted from direct interactions between those who buy and those who sell a service. These proposals did not consider contextual influences that could affect this evaluation.

The vulnerabilities mentioned above reinforced our research option of integrating social aspects in the study of business model scenarios. The factors addressed by the literature in network configurations (e.g., environmental influences, dynamic interactions, or negotiation mechanisms) also contributed to strengthen the importance that a social outlook could have on a business model. Its inclusion enhances the knowledge on business models and supports the understanding of the intertwined web of value propositions in these decentralized environments, without a single point of authority for decision making. Consequently, it minimizes the extremely difficult task in leading a negotiation process among actors. The contributions from the literature review on business models to the conception of our approach are summarized in Table 6.

Table 6: Business model guidelines to the development of BIZ2BIS

Author	Topics to address in the development of BIZ2BIS
Timmers (1998), Al-Debei and Avison (2010)	Cover dimensions of the business model concept such as value proposition, value architecture, value network, and value finance
Osterwalder and Pigneur (2002), Shafer et al. (2005), Faber et al. (2003)	Take into account business model components like value proposition, technology, cost structure, revenue model, target customer, distribution channel, value configuration, and partner network
Gordijn (2002), Osterwalder (2004), Bouwman et al. (2008b)	Define a standardized outlined plan for the approach application in order to guarantee that critical issues are not overlooked and that the dependencies from analysts' experience and personal judgments are minimized
Gordijn (2002), Osterwalder (2004)	Use the approach as an effective communication tool to think about, discuss, innovate, and articulate a business model
Faber et al. (2003), Shafer et al. (2005), Gordijn et al. (2009)	Address the potential offered by the network concept in the business model domain
Parolini (1999), Weill and Vitale (2001), Allee (2008)	Detail the kind of ties established among the network elements to obtain clues on how these could strengthen the business model, obstruct movements, lead to possible locks or encourage undesirable conducts
Osterwalder and Pigneur (2010)	Develop intuitive and simple to use supporting tools that can promote collaborations with all the business model's participants
Brandenburger and Stuart (1996), Gulati et al. (2000)	Identify vital dependencies in a the networked business model (e.g., important resources, indispensable actors, critical value propositions)
Parolini (1999), Normann and Ramírez (1993), Iansiti and Levin (2004)	Develop negotiation mechanisms to promote eventual adjustments to new circumstances and balance the network pursuit for joint value creation
Gordijn (2002), Bouwman et al. (2012)	Point out the need to change, to reconsider adopted options, revisit past assumptions, and rebuild taking into account new contexts
Gordijn and Akkermans (2003), Bouwman et al. (2012)	Make use of alternative business model scenarios to encourage discussion, explore new opportunities, facilitate discussion on possible changes, consider viable alternatives, and encourage innovation
Pouloudi et al. (2003), Pateli and Giaglis (2004), Stanoevska-Slabeva and Hoegg (2005)	Address social factors in the discussion, design, adoption, and change of business models
Tapscott et al. (2000), Weil et al. (2005), Allee (2008)	Consider other influences beyond financial flows in the business model evaluation (e.g., prestige, capability to lock-in, and brand recognition, contextual influences)
McGann and Lyytinen (2002), Gordijn (2002), Bouwman et al. (2012)	Explore connections points between business models and their technological support
Gordijn (2002)	Translate business models (including its social context) into high-level requirements for the specification of its underlying information system

In the next chapter we will look for insights that can help us consider the social dimension of networked business models in our approach.

Chapter 3

The social dimension of business models

The literature review in the previous chapter allowed us to identify concepts, viewpoints, and proposals from the business model domain that stand out frequently. The performed survey also strengthened our conviction that a business model is not designed in a total vacuum and stressed the importance of social issues in its conception and development. Although many of the available proposals did not focus on the study of business models in network configurations and on the relationships established among its stakeholders, the undeniable technological advances made them a reality. The complexity of influences and interests that can be found in these scenarios highlighted even further the relevance that the social dimension may have in the study of business models. To overcome this shortcoming, we decided to complement the insights gathered in the previous chapter with contributions from the social domain, endowing our research with an additional and innovative look towards the business model field. In this endeavor, our main inspiration was Actor-Network Theory (ANT). To clarify its contributions, this chapter explains its key ideas, underlines how they influenced our work, and discusses how its concepts were integrated in our approach to guide the study of networked business models and provide valuable outcomes to their stakeholders.

ANT, also known as "sociology of translations" (Callon, 1986b), describes socio-technical ensembles as heterogeneous networks of human and nonhuman actors (e.g., people, organizations, cultures, ideas, plants, computers, and money). In ANT, neither the social nor the technical are privileged. Instead, the interrelated character of social and technical actors is stressed. ANT brings forward a more profound understanding of the networked business model and offers us a privileged position to explore the relationship between business models and information systems. Its lens can reveal insights on how business participants' interests are perceived, and aligned, as well as on how uncertainty and ambiguity can be managed.

We will start this chapter by explaining why a socio-technical account can contribute to enhance business model study (section 3.1). Then, in section 3.2, we will present ANT, providing its historical background and covering its salient features. In section 3.3, we describe ANT's vocabulary used in our study. Section 3.4 expands on the main arguments of this chapter, addressing the reasons why we used ANT in the business model field. It explains in detail how and which concepts of ANT have been employed, i.e., integrated in our approach to study business models in network configurations. It also points out ANT's contribution to the specification of the high-level requirements of the information system that will support the business model. In section 3.5, we explain how it is possible to operationalize the information gathered using ANT and, in section 3.6, we describe particular aspects of other social theories and concepts that we used to cover issues not addressed by ANT. In section 3.7, we present the inputs brought from the social domain to the business model study. Finally, in section 3.8, we present our conclusions.

At the end of the chapter, the reader should be able to:

- Comprehend ANT's principles and its main concepts;
- Understand the advantages of complementing business theories with ANT;
- Identify social concepts used to shape our approach and perceive their application to the business model domain.

3.1 Social and technical intertwine in business models

Jomini, a brilliant general in the French and later in the Russian service in the nineteenth century (Shimizu et al., 2006), argued that the principles of war were always valid, independently of the situation or the technology employed. He defended the effectiveness of massive frontal attacks. In his opinion, this principle was valid regardless of the technology employed. These ideas of direct attacks had their basis in the era of muskets and became less attractive with the repeating rifles, but remained valid until the beginning of the 20th century. However, with machine guns, widely used in the First World War, direct attacks became unreasonable. These events show how technological developments in war equipment can compromise established military principles and strategies.

It is also interesting to ponder the ways in which technology can embody specific politics, forms of power and authority. The bridges over the ark ways on Long Island, New York, are a good example of this. Robert Moses, who built roads, parks, bridges, and other public works from the 1920s to the 1970s in New York, designed and built many of those overpasses with as little as nine feet (2,75 m) of clearance at the curb. Through evidences provided by Moses's biographer, Robert Caro, it was possible to discover that this architectonic option intended to achieve a particular social effect, reflecting Moses social class bias and racial prejudice. Automobile-owning whites of upper classes would be free to access the parkways. Poor people and blacks, who normally used public transportation, were kept off that area because the twelve-foot (3,65 m) tall buses could not clear the overpasses. One consequence was to limit access of racial minorities and low-income groups to that part of the city (Winner, 1986).

The scenarios described above illustrate how technology is interwoven with aspects so distinct such as society, science, politics, and economics, as described in Thomas Hughes (1986) metaphor of the "seamless Web" (it conveys the notion of holism and points to the fading of boarders). This ensemble between the social and technical is also evident in the nature and configuration of the present business models. For instance, the business model developed by Blizzard to support World of Warcraft, a Massive Multiplayer On-line Role Playing Game, that exceeded, in October 2010, 12 million players (Blizzard Entertainment Inc., 2011), owes its network configuration to the astounding advances in ICTs. However, the game options and its extensions reflect social worries. For instance, it is possible to setup parental control preferences (to define a time-table, or to establish a maximum time of use) to answer parents worries. The game also provides opportunities. For example, users with limited time to play their game but with money to spend encouraged the commercialization of the game features by others (Correia, 2006). Asian companies were able to introduce game items into the market at very low cost and the original Blizzard business model had to be readjusted.

The World of Warcraft business model is just another example that supports the conviction that the technical and the social worlds are profoundly intertwined. On the one hand, technological improvements enable the development of innovative world-wide business models and play a key role in today's organization. On the other hand, the technological solution also embodies social concerns and possesses social implications that affect their environment.

The study of the relationships between the technical and the social provides additional insights to explore the specificities of the environment where business models operate. For example, it can provide us with the means to understand what is expected from technology, to comprehend its implication in the business model activities, to search for new solutions or novel configurations that can satisfy the business participants' interests, or to create the necessary conditions to promote the implementation of the business model. To include in the study of business models the capacity to regard their social and technical positions, emphasizing their interrelated character, we complemented business model theories with insights from ANT. Next, we will explain some of ANT's used key ideas and describe how they influenced the research outcome in our study.

3.2 Situating ANT

Before introducing ANT's tenets, we will present its origins. To detail its roots would quickly make us overpass the scope of this chapter. However, it is our belief that to map out its background, even if succinctly, will be helpful to position ANT.

Several research domains proposed a number of factors as determinant of human thinking. We will concentrate on the proposals with stronger ties to ANT to clarify the course that led to its appearance. This is the case of the sociology of knowledge (Fine, 1996), shaped by the work of seminal researchers as Marx, Mannheim and Durkheim, which emphasized the causal role of social factors in shaping individual belief. These researchers dismissed the viewpoint suggested by mathematics and the natural sciences from their social analysis (Kukla, 2000). In turn, the sociology of science was dominated by the institutional approach of Robert Merton (1973) and his supporters. This designation could be misinterpreted as a sub discipline of sociology of knowledge that dealt with scientific knowledge. Instead, it addressed science as an institution and the study of scientists' norms, values, career patterns, as well as the reward system that drove scientific activity. This implies that scientific knowledge continued to be outside the grasp of this branch of research (Fine, 1996, Kukla, 2000).

With the rise of the movement referred to by its practitioners as sociology of scientific knowledge (SSK) (Woolgar, 1988), the types of social explanations that figure in the classical sociology of knowledge were applied to the intellectual content of science. This movement gave birth to the "Strong Programme" (Barnes, 1974, Barnes, 1977, Bloor, 1976), initiated by the so called Edinburgh school in the mid-1970s. This school was well-known for its postulates of symmetry, objectivity, causality, and reflexivity of any explanation of social phenomena (Bloor, 1976, p. 5). It argued that social scientists when tracing the cause of beliefs should be impartial to its truth or falsity, and that both sides of these dichotomies require explanation (Bloor, 1976). Barnes, in marked contrast with Bloor, did not accept the possibility of general theories and restricted his investigation to case-by-case analysis (Manier, 1980).

The Strong Programme is also related to the work done at Bath School, see for instance, Harry Collins (1975). This line of research promoted, in particular, the Empirical Programme of Relativism (EPOR) and emphasized micro-social studies of laboratories and experiments. Its attention was focused on exploring scientific controversies that contributed to exposing the interpretive flexibility of scientific results (Pinch and Bijker, 1984, Pickering, 1992).

Pinch (a Collin's student) and Bijker explored an emerging interest in the social study of technology to extend topics from SSK into the domain of technology (Pinch and Bijker, 1984). They proposed the Social Construction of Technology (also referred to as SCOT) and took "relevant social groups" as their starting point. SCOT, like EPOR, emphasizes that scientific findings are open to more than one interpretation and the closure of debate. However, in SCOT the interpretive flexibility is linked to the social groups' capability to construct and interpret technology according to their needs. This can be contentious, since there is flexibility in the way the solutions are designed.

The closure in SCOT emerges when the social groups involved in a problem decide that the problem is solved - an artifact achieves stabilization. From the early history of the bicycle, Pinch and Bijker (1984) provide examples of closure and stabilization, social shaping, interpretive flexibility, and the influence of social groups (e.g., the discussion around the use of pneumatic tires, the size of the wheels according to the interests of particular groups: women, older men, and young men). These examples support the analysis of the causes for technological failure or success.

SCOT can be identified under the general label of Science and Technology Studies (STS) (House, 2004). STS is the study of science and technology in a social context. It follows the principle that scientific knowledge and technologies do not evolve in a vacuum (Law, 2004). STS is considered a branch of science studies, a descendant of it, or overlapping with it (House, 2004), pointing out what was called by Steve Wolgar (1991) as the "turn to technology".

In the late 1970s new proposals that had similar concerns with certain aspects of SSK appeared. However, their intention was to integrate new approaches. For instance, the book Laboratory Life (Latour and Woolgar, 1979) is considered a landmark that guided the move towards the study of scientific practices. Its attention was focused on what scientists really do by looking at science “in the making” (Pickering, 1992).

The study of scientific practices and the idea that social and technical views are considered on equal footing is central in another proposal that was born out of the interdisciplinary field of STS: the Actor-Network Theory (ANT). Latour (1992b) noted that the difference in essence regarding human and non-human is the major contention between ANT and sociological position of SSK. In the latter, as stated by Cressman (2009), it is necessary to recognize in advance the essence of humans and to distinguish their actions from the inanimate behavior of technological and natural objects (e.g., computers, laboratory instruments, research institutes, protocols, and standards). In ANT, human and nonhumans - from an analytical stance - are treated equally.

Since the mid 1980s, Michel Callon and Bruno Latour worked on ANT (Callon and Latour, 1981) at the Centre de Sociologie de l'Innovation of the École Nationale Supérieure des Mines de Paris. A variety of intellectual traditions are detected in ANT. For example, Algirdas Greimas’ actant theory (1982), Michel Serres’ notion of translation (Brown, 2002), Foucault’s theory of power and micro-politics (1980), and Deleuze and Guattari’s conception of the assemblage (1987). Subsequently, ANT has been enriched by its original actors and others, like John Law (1992) and Madeleine Akrich (1992). Next, we will initiate its discussion.

ANT accommodates the role of non-humans in the process of knowledge construction and social change (Toennesen et al., 2006). It considers that both technical and social determinism can be flawed and proposes a socio-technical account (Latour, 1986a, Law and Callon, 1988) that denies that purely technical or purely social relations are possible and neither the social nor the technical positions are privileged. Harbers (2005) highlights this entanglement between the social and the technical by putting the question: “Where does one draw the line between man and machine, between human responsibility and technical inevitability, between the subjective world of politics, culture and morality and the objective world of science, technology and nature?”. This author (2005, p. 10) argues that “we are confronted here with a hybrid situation in which human beings and technology are tightly interwoven - a mixture, a muddle of man and machine”. By not accepting a fundamental distinction between human and nonhuman, which is central to Western sociology, the actor-network approach is based on a pre-modern footing (Law, 2004).

ANT’s authors consider that the flip side of the claim that technology is socially shaped is the claim that technologies shape their social contexts (Brey, 2003). For instance, the steam engine transformed society by providing new forms of production; the Gutemberg printing press changed it by revolutionizing the access to written information. The impact technology has had on society has provided new scenarios to explore and has changed behaviors. For this reason, this movement of transformation considerers that the idea of society as a network of social relations is false, since society is made up of socio-technical networks (Ibid.).

In ANT, human interaction relies on material elements, which demands that non-human actors should also take “their rightful place as fully fledged actors in associations, relations and networks” (Ashmore et al., 1994 , p. 735). These actors can have an influential role within a network, depending on their own actions. They should be treated using the same conceptual apparatus: described through the same language and analyzed according to the same procedures. The symmetric treatment of human actors and technology has been criticized in the literature (Collins and Yearley, 1992). However, we do not interpret that assumption literally. To regard them as equal signifies considering the roles, activities and importance assigned to both as they are engaged in the network.

ANT approaches science and “technology in the making” as opposed to “ready made” science and technology (Latour, 1987). Through ANT’s guidelines, it is possible to explore how networks are forged and how exchanges are conducted. In addition, it also improves the comprehension about the interests that sustain the actors, the reasons that allow networks to achieve stability, the competition among networks, and how they are made more durable over time (Tatnall and Gilding, 1999).

The example presented below, which is considered an emblematic reference in ANT’s bibliography, was introduced by Callon (1987) and illustrates ANT’s logic through the attempt to introduce an electric car in France. The associations created in that network context are traced and analyzed as a fusion of efforts performed by the different actors to convince others, according to their own interests (Bijker, 1994).

A group of engineers working for EDF (Electricité de France) in the early 1970s proposed the development of an electric vehicle. In this venture, besides the specification of the vehicle’s precise technical characteristics, they considered the social universe in which the car would be brought into play. Technological topics, such as accumulators, fuel cells, electrodes, electrons, catalysts, and electrolytes are regarded as being entangled with aspects so diverse as environmental factors (e.g., air pollution and noise caused by the motor vehicle), social issues (e.g., consumer habits in which the private car constituted a primordial element of status), or financial subjects (e.g., governmental agencies that could hold up the research and economic impact on public transportations).

EDF’s engineers, in addition to their technical duties, also identified their collaborators on the project, defined the roles, and attempted to enroll them. The Compagnie Générale d’Electricité would be asked to develop the electric motor, Renault would assemble the chassis and make the car bodies, and companies that ran urban transport systems would integrate the electric vehicles in their transport systems. Callon stated that EDF’s engineers, whether they wanted or not, were transformed into sociologists, or what he calls “engineer-sociologist” (Callon, 1986a). They permanently combined scientific and technical analysis with sociological analysis to achieve success.

Three years later and the support around the electric car and its society began to wane. Besides the technical issues (the catalysts refused to play their part in the scenario presented by EDF), one of the main problems of this project was the resistance of actors, like Renault, whose vision of the future was different from that of EDF. In their opinion, the criticism geared at the traditional motor car was not a sign of a demand for a new development. It merely expressed temporary worries. These factors, in conjunction with others like the weakness of the environmental protest movements, led the project to an unsuccessful end. The traditional motorcar industry maintained its power - during the electric car project Renault developed R5 and reached excellent results. In spite of the failure of the EDF project, some changes have been introduced in the traditional construction process (it pollutes less, the cars consume less petrol, and cost less to manufacture).

The project of the electric car, described above, illustrates how sociological and technical considerations can be inextricably linked. The technological advances created the propitious conditions to the development of the electric car that could change the French society. In this venture, in addition to the technological component, the project's leaders had to consider topics such as environmental issues, industrial contributions, and governmental agencies that could create a favorable (or unfavorable) context to the project development (e.g., financial aspects and application of the technology). The engineers were, simultaneously, designing both a technology and working with all the restrictions of the social world in which the vehicle would be deployed.

To address the perspectives of analysis brought up by a scenario like the one above, ANT follows three principles, namely agnosticism, generalized symmetry, and free association (Callon, 1986b). Agnosticism implies coming into the investigation without any a priori assumptions. The researcher has to abandon preconceptions and be impartial towards all actors in the network, whether they be human or non-human - "No point of view is privileged and no interpretation is censured" (Callon, 1986b, p. 200). Symmetry assumes that human and non-human actors have equally significant roles and their conflicting viewpoints can be explained in the same terms by employing a single explanatory stance. As Callon (Ibid.) puts it: "The rule which we must respect is not to change registers when we move from the technical to the social aspects of the problem studied". Finally, the tenet of free association requires that there can be no assumed distinctions between the technical and the social worlds in coming to an understanding of the phenomenon being researched. These differences are considered contentious, since they should be the result of analysis, rather than its point of departure (Callon, 1986b).

The actors are described in ANT based on the complex interactions they perform in the interconnected network of relationships. ANT advocates that the researcher should follow them around as they go about constructing heterogeneous networks, avoiding pre-established ideas about the network (Toennesen et al., 2006). As Latour (1987) and Callon (1991) underlined, actors are essentially defined by the relationships established among them, rather than by their essential or inherent features.

ANT's seminal developers defined a particular vocabulary to identify the participants in a network and to describe the means by which they are maneuvered, co-ordinated, aligned, and rendered stable. Its concepts do not overlap the actors' own vocabularies; on the contrary, it provides the means to follow the actors respecting their own context (Latour, 2005, p. 29-30). In the next section, we will start to disclose the way ANT's lens helped us to look at networked business models and how it inspired the development of our approach.

3.3 ANT's vocabulary translated to the business model domain

Before presenting ANT's key concepts, it is important to tackle the difficulties of explaining it as a stable approach. ANT has received contributions from several authors, who do not always share the same opinion and has been adopted by distinct research domains (e.g., information systems, biology, and health services). The creative and fertile networks which were formed around ANT's description have created the perfect conditions to reshape ANT's meaning and content. In fact, and following the notion that nothing is truly stable and is always subject to change, each time ANT is integrated in a new research, it may suffer adjustments. Due to the process of ongoing transformation that ANT has been subject to, its definition is no longer in the hands of its mentors. Therefore, advancing with a single set of principles, the "true version", is very complex and contradicts the desire to perceive ANT as a set of practices with transformative properties (Cloatre, 2005).

In the following sections, we will focus our attention on ANT's concepts that helped us describe a business model in a network configuration, disclose tactics performed when searching for the alignment among its actors, and perceive the role of its underlying information systems. To illustrate how these concepts can be applied in the business model context, we will provide an illustrative business idea (FoodAtYourDisposal, described below). This idea was chosen due to its simplicity, allowing the reader to concentrate on the adoption of ANT and not on the case specifics.

The company HereForYou created a business (called FoodAtYourDisposal) to manage take-away orders for several restaurants. The mediation between the customers and the restaurants is supported by a portal. When an order is received, the request is sent to the selected restaurant that confirms the availability to satisfy the request. When this happens, a cooking time is presented and the portal sends the information back to the customers, to reconfirm. If they agree with the presented conditions, a HereForYou's employee will pick up the order at the restaurant and deliver it to the customer, from whom payment will be collected. Agreements with local farmers were negotiated to offer special conditions of acquisition to restaurants doing business via the portal and encourage their participation.

FoodAtYourDisposal's revenues are obtained through a small activation rate to access the portal and a fee of 5% over each request. By paying extra fees, the restaurants can strengthen their presence in the portal (e.g., put their menus at the top of the search results list or have special sections to advertise promotions).

3.3.1 Actor and actant

According to Latour (2005, p. 71) an actor is something (e.g., person, group, idea, car, plant, or animal) that "acts, or to which activity is granted by others. It may not necessarily be the source of an action, but something that modifies a state of affairs by making a perceptible difference". This definition does not account for the distinction between social and technological elements and focuses its attention on the importance of the actions performed by the actors.

When actors act, they acquire competences. This process provides the necessary support to distinguish between the concepts of actant and actor. An actant may be any agent, collective or individual, that can associate or disassociate with other agents (Uden and Francis, 2009). Actants participate in network associations, which in turn define them, name them and provide them with substance, action, intention and subjectivity (Callon, 1986b). An actor is further defined as "Whatever acts or shifts action, action itself being defined by a list of performances through trials; from these performances are deduced a set of competences with which the actant is endowed (…) An actor is an actant endowed with a character" (Akrich and Latour, 1992, p. 259). While actant is the thing itself in its unspecified "nature", actor comprises the competences which are attached to it. The competences are negotiated in processes of trial (and error) (Uden and Francis, 2009). In summary, the main difference between actors and actants is that only actors are able to put actants in circulation in the system (Uden and Francis, 2009).

Latour (1992b) emphasized that what a network element is is not as important as the action itself and the competences it performs within the chain. For example, a syringe, as a piece of plastic and metal, is an actant. Within the context of a health center, a valid syringe acts and it has an attributed competence (for instance, allowing inoculations) and it becomes an actor. Each actor has its own goals that gain relevance when shared with additional actors. To achieve a set of goals, the syringe has to be associated and aligned with surrounding actors such as nurses, alcohol, cotton, patients, and vaccine cards. The network environment and the relationships established among the actors influence how they redefine their behavior.

Actors are never located in bodies alone, but rather are patterned networks of heterogeneous relations. For instance Bruno Latour (1988a) shows that Pasteur was nothing more than a network of heterogeneous elements: laboratories, domesticated strains of bacteria, notebooks, statistics, a farm at Pouilly le Fort, sheep, and vaccines. Pasteur was a combination of several elements which produced "Pasteur-the-great-research network" (Callon and Law, 1997), which was an actor in the French scientific research network. Each actor is made up of actors and at the same time is also part of an actor. Thus, an actor (be it a person, a device, or, for instance, a text) may be regarded as an intricate network in its own right (Latour, 2005, p. 71).

In the FoodAtYourDisposal scenario, the actor concept in ANT led us to consider human and non-human actors in the business model. The customers, the restaurants' employees, and the local farmers are examples of human actors, while the portal, the distribution scooters, and governmental laws are non-human.

3.3.2 Network

The notion of network has been quite popular in the Social Sciences since the 1950's, and has also been used in a wide range of disciplines such as International Relations, Organizational Analysis, Health Studies, Biology, Information Systems, and Geography (Cloatre, 2005). This concept is a key factor in ANT and is defined as a "group of unspecified relationships among entities of which the nature itself is undetermined" (Callon, 1993, p. 263). This definition reinforces ANT's inclusive character (it is not restricted to human actors) and characterizes networks as a shifting system of relationships, alliances, and exchanges among their elements (Underwood, 1998).

In ANT, like in geography, the network concept involves a series of transformations, and translations (how artifacts become a result of negotiations that seek an alignment of the actors' interests). For instance, the spreading of networks in order to manage natural resources shows transformations carried out by human intervention in the physical landscape, altering it (McBride, 2003). Another example would be the control of water through canals and dykes in Southern Mesopotamia, which provided the basis for capitalizing on the economic potential of the southern plains. This change allowed the emergence of early large-scale communities in which culture could develop and people could move beyond subsistence living (Leick, 2001). This interpretation of the network concept emphasizes the understanding of circulations and transformations that reshape networks through series of transformative practices. Actor and network redefine each other permanently - actors change networks and networks define actors.

The massive installing of Internet cabling distorted the above connotation assigned to the network concept. Nowadays, the term network is usually understood as a set of connections through which information can circulate in an unaffected way. It clearly means "a transport without deformation, an instantaneous, unmediated access to every piece of information" (Latour, 1999a, p. 15). This "new perception" caused some misinterpretations. However, the network concept, in ANT context, implies a series of transformations.

ANT is interested in understanding how networks enlist actors and in how translations are performed to overcome resistances and achieve network stability. It also focuses on how actors are motivated, as well as on the actions developed to prevent them from abandoning the network. Furthermore, ANT covers how networks become increasingly transportable (able to be used by other networks), and how some come to be larger and influential than others. Manifestations of power (where it comes from and how it is exerted) are also addressed.

Power and network connectivity are intertwined, since each network is the effect, or result, of the connections that constitute it. In ANT, we should not ask if one network is more powerful than another; rather, we should ask if an association is stronger than other. As Latour puts it

(1986a, p. 265), "When you simply have power – in potentia – nothing happens and you are powerless; when you exert power – in actu – others are performing the action and not you (…) [power] as an effect, but never as a cause".

In this section, it is also important to clarify that the ANT's notion of network needs to be perceived as more than the agglomeration of actors, more than just an entity above the individual level. As mentioned in the previous section, each actor is made up of actors and, simultaneously, can be part of an actor. Or, using the vocabulary of actor-network, each actor is itself a (simplified) actor-network and is at the same time part of other actor-networks.

Actor-networks are the gathering of relationships that create a particular entity that might appear as unified, and refers both to the whole and the parts (Cloatre, 2005, p. 94). Everything, then, is an actor-network, "reducible neither to an actor alone nor to a network (…) An actor-network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of it" (Callon, 1987, p. 93)". Based on this perspective, a network element can be considered as both an actor and a network.

The term actor-network "is intentionally oxymoronic, a tension which lies between the centred 'actor' on the one hand and the decentred 'network' on the other" (Law, 1999, p. 5). This tension has generated questions that address the debate between agency and structure. However, ANT did not intend to occupy a position in this debate and its authors have dismissed the issue. ANT sidesteps the question since its central tenets are based on the idea that actors and networks depend on each other and that no clear differentiation between the global and the local must be performed. Networks are seen as complex arrangements of space, with no clear centre or dependency on hierarchical relationships (McBride, 2003).

Using the perception described above, is not possible to have a micro or macro level of analysis, they are "local effects of hooking up to circulating entities" (Latour, 1999a, p. 19). The connections are mobile along the networks, challenging our notions of far/close, small scale/large scale and inside/outside (Latour, 1996b). As Latour (1999a, p.18-19) described it, actor and network "designates two faces of the same phenomena, like waves and particles, the slow realization that the social is a certain type of circulation that can travel endlessly without ever encountering either the micro-level – there is never an interaction that is not framed - or the macro-level - there are only local summing up which produce either local totalities ('oligoptica') or total localities (agencies)". Since actors are actor-networks in infinity, it is necessary to choose how the network under research is "zoomed in and out" and which actors are included to delimit the phenomena under analysis (Nijland, 2004).

The concept of network in the business model domain provides an innovative look at the FoodAtYourDisposal spatial configuration and at the associations among the actors. To consider that a network element can be both an actor and a network makes it possible to explore other networks with influence on the business model (e.g., the local farmers' network could provide clues on how to enhance FoodAtYourDisposal). The ability to consider overlapping dimensions provides a more comprehensive vision of the network (including its boundaries) and enhances its understanding.

3.3.3 *Theory*

There is an ongoing discussion questioning whether ANT is a theory or a method. For example, within the same year Callon's opinion changed from a "method" or "certain instruments of analysis" (Callon, 1986b, p. 33) to the more encompassing notion of an "analytical framework" (Callon, 1986b, p. 196). As Latour (1999a, p. 20) put it, "Far from being a theory of the social or even worse an explanation of what makes society exert pressure on actors, [ANT] always was, and this from its very inception, a very crude method to learn from the actors without imposing on them an a priori definition of their world-building capacities".

As a theory, ANT addresses what to study (Gad and Jensen, 2010). However, it does not explain why a network takes a particular shape. Instead, it is focused in exploring how networks are created, how they are maintained, or how they collapse. Its authors believe in the advantages of learning with actors not only what they do, but how and why they do it (Latour, 1999a). They argue that explanations should arise out of this type of analysis that can provide insights about emergent patterns of order and/or disorder. Latour urges that what circulates has to be defined by what constitutes it. Among other aspects, it is characterized by the competences it is endowed with, the associations it is made to support, its sanctions, and the background in which it is circulating (Latour, 1996b)

As a method, ANT traces associations, controversies and uncertainties, not imposing a pre-established grid of analysis on actors. It gives voice to the actors and learns from them without prejudging their actions (Gad and Jensen, 2010). It focuses on description, which lies at the foundation of its principles (not prediction or explanation). ANT's advice consists in following actors into translations to understand how these "define and associate the different elements by which they built and explain their world" (Callon, 1986b, p. 201). In his unique way, Latour makes the point, writing about the actors: "They, too, compare; they, too, produce typologies; they, too, design standards; they, too, spread their machines as well as their organizations, their ideologies, their states of mind. Why would you be the one doing the intelligent stuff while they would act like a bunch of morons?" (Latour, 2004). In Latour's opinion it is fundamental to describe what the actors do to expand, relate, compare, and organize. Interestingly, he says: "Don't try to shift from description to explanation: simply go on with the description" (Latour, 2004).

ANT enhanced our understanding on business models based on what is learned with each of the actors. In the FoodAtYourDisposal example, following all the involved actors and tracing their associations helps detect the network boundaries, detail interactions, or sense possible controversies (e.g., concerning revenues) that could compromise the business model.

3.3.4 *Translation*

Each actor has its own view of the network and its individual agenda and goals. These gain relevance when they are shared by different actors, creating a common set of interests. Translation is the process of engaging the different actors and it has been described as pivotal in the analysis of the interactions in an actor-network (Somerville, 1997). It approaches two aspects: on the one hand, translation is assumed as an interpretation which can lead to representations of common interests (Callon and Latour, 1981). This transformative component of translation is emphasized in Callon (1991, p. 143), where this author shows that translation operates between actors - an actor gives definition to another actor, endows him/her/it/them with "interests, projects, desires, strategies, reflexes, afterthoughts". On the other hand, translation is a set of methods by which actors within a network will try to enroll the other actors into positions that can serve their own purposes. According to Callon (1986a, p. 17) these methods involve: "(a) the definition of roles, their distribution, and the delineation of a scenario; (b) the strategies in which a [future state actor-network] renders itself indispensable to others by creating a geography of obligatory passage points; and (c) the displacement imposed upon others as they are forced to follow the itinerary that has been imposed". Callon (1986b), identified four distinct phases in the process of translation:

- Problematization: a focal actor (the one driving the creation of the new network or changes to the existing one) frames the problem and defines the identities and interests of other actors that are consistent with his/her/their own. Since some actors emerge or fade away before a stable network is achieved, ANT looks at the focal actor as the one to be followed in order to interpret the process of network construction.

  The focal actor renders himself/herself/themselves irreplaceable by defining a process under his/her/their control that must occur for all actors to achieve their interests (Bloomfield et al., 1994, McMaster et al., 1997b). This process, according to Callon (1986b), is designated as an obligatory passage point (OPP), and when focal actors define it, they are making themselves indispensable to other actors. An OPP must be negotiated as part of the solution and should be of common interest for the identified network participants, in spite of their different goals and agendas. Its purpose is to keep all other actors in place and offer a vantage point to follow the translation process (Bakhshaie, 2008).

  The actions performed by the focal actor can be viewed as part of a strategy to align the other interests with his/her/their own (Tilson and Lyytinen, 2005), and can involve methods so diverse as seduction, violence, and transactions (Callon, 1986b). An OPP allows the establishment of behaviours that actors need to perform to achieve their intents: "To pass through the obligatory passage point, the other actors must accept a set of specific conventions, rules, assumptions and ways of operating laid down by the first actor" (Tatnall and Davey, 2001 p.3).

- Interessement: entities enlisted by the problematization can accept being integrated, or, on the contrary, they can refuse problematization by defining their interests in a different manner. Interessement encompasses the strategies by which the focal actor attempts to enroll others according to the entities and roles defined for them in problematization (includes searching for new allies, isolating actors not yet enrolled, and encouraging others to overcome obstacles in the way of passing through the obligatory passage point). It is important to understand that the actors to enroll are tentatively implicated in other actors' problematization, influencing their entities in other competitive scenarios (Callon, 1986b). It is necessary to implement an actors' recruitment process – creating an interest and negotiating the terms of their involvement.

Many times, the focal actor does not need to convince all the actors from a group, but its representatives. Groups of actors with the same goals can be represented by a single actor, a spokesperson. When a spokesperson talks in the name of others, he/she is translating other actors' will and becomes stronger (Callon and Latour, 1981).

- Enrolment: requires more than one set of actors imposing their will on others for enrolment to be successful (Uden and Francis, 2009). It is only achieved when actors take on the network's problematization as their own and accept the roles defined for them during interessement. This phase is characterized by the group of multilateral negotiations that can lead to the establishment of a stable network of alliances. Latour (1987) suggests five strategies for enrolment: 1 - Cater to others interests; 2 - Convince others that their usual ways are cut off; 3 - Seduce them through a detour; 4 - Reshuffle interests and goals; and 5 - Become indispensable to others.

- Mobilization: occurs when translation is complete, actor interests are stabilized and controversy is removed. With mobilization, enrolment is transformed into active support, it assumes a definitive physical reality which can be materialized through a series of displacements (Callon, 1986b, Law, 1986). Mobilized actors are committed to a common course of action (Holmström and Robey, 2005), and have the necessary conditions to create an interest in the network or to develop sub-networks for themselves.

  This phase includes the use of a set of methods to ensure that allied spokespersons act according to the established and do not betray the network interests (Mähring et al., 2004). In a scenario with a wide acceptance of the adopted solution, the number of absent entities represented by spokespersons increases (Uden and Francis, 2009), and what is true for a few is assumed as true for the whole of the population. However, this consensus can be contested at any moment, and treasons can emerge. In order for the spokesperson not to betray the interests of their group, a set of methods are developed to establish the legitimacy of the representation.

It is worth mentioning that not all translation processes pass through all these phases and that translation processes may fail and halt at any stage. These four moments are often found to be more fluid and interrelated than what is suggested by Callon (Mähring et al., 2004). Researchers like Figueiredo (2004) and Scott and Wagner (2003) state that their order of application depends on the actors' strategic efforts to negotiate and maneuver one another into networks of aligned allies.

The aim of translation "can be seen as to bring together complex entities into a single object or idea that can be mobilized and circulated like a branded commodity or a taken-for-granted fact" (Clark, 2001). If an actor was able to develop a successful strategy that has organized others according to the established purposes, it can be said to have translated them (Masys, 2010).

During translation, actors negotiate and manipulate others with the aim of enrolling them. This process has political implications: "The result [of translation] is a situation where certain entities control others. Understanding power relationships means describing the way in which actors are defined, associated and simultaneously obliged to remain faithful to their alliances" (Callon, 1986b, p. 224).

In order to achieve stability it is necessary to maintain a continuous process of negotiation to align actors' interests and prevent betrayals and desertions that can cause the network to collapse. This resistance to assaults from competing translations is captured by Callon's concept of irreversibility (Callon, 1991). It refers to the degree to which, in a certain situation, it is impossible to go back to a point where alternatives exist (Callon, 1991).

The concept of translation aids in understanding how the interests involved in a business model can be aligned. In the particular case of FoodAtYourDisposal, translation helps expose actors' expectations and how they are enrolled. For instance, it describes how the restaurants were convinced to participate. The obtained information (e.g., relationships and roles assigned to the actors) enhances understanding over the business model and may assist in the creation of alternative scenarios. For example, a restaurant whose menu is constantly requested by the clients threatens to abandon the network due to the fees charged over each request. In this case, it is fundamental to perceive the implications of its abandonment and how the situation can be handled.

3.3.5 Inscription

In ANT the search for social order rests on the notion of translation. Besides its four phases, the process of inscription is also fundamental in building and stabilizing actor-networks. Inscriptions is an act that actors imprint on other actors to shape their attitudes and properties (Akrich and Latour, 1992). It also refers to the way interests, values, rhetoric, social and economic relationships, patterns of use, and designer's beliefs are converted into devices or materials, such as reports and scientific papers, or incorporated in technological solutions (Akrich and Latour, 1992, Bowker and Star, 1994, Monteiro, 2000). Inscriptions also prescribe a program of action, which specifies the properties of a setting, sustaining and embedding the social discourses of the actors into technical artifacts. For instance, information systems developers can formulate and shape the services of a business model's underlying information system in order to lead and control its users. Inscription's capacity to prescribe actions supports the idea that it can be used to standardize practices in organizations (e.g., the steps to fill in a form). Human actors are able to inscribe onto non-human actors, and vice-versa (Lindahl, 2005). Inscription and translation are interrelated and to a large extent take place simultaneously, as soon as technology starts to be considered and developed (Latour, 1991).

Realities are constructed in practices conducted by the networks of elements that make up the inscription device – and the network of elements within which that inscription device resides (Law, 2004). Since inscriptions can lead the actors to behave in a certain way, many of them attempt to inscribe their vision and their interests into the artifacts (Faraj et al., 2004). Latour underlines that the behavior imposed back onto the human by non-human delegates prescription, being this the moral and ethical dimension of mechanisms (Latour, 1992a).

Although inscription devices and practices may be adopted as a form to create and transport knowledge across different communities of practice, the interpretation of such artifacts may be problematic. According to their own interests, the communities may follow anti-programs (deviate from the inscribed patterns) and compromise the network stability (Latour, 1991). Inscriptions can be either strong or weak (Hanseth and Monteiro, 1997). The latter will not change the actor-network in the desired way and might in fact result in unexpected changes to the network. The strength of inscriptions depends on the irreversibility of the actor-network into which they are inscribed (Monteiro, 2000). As inscriptions become stable and regular, they reduce the possibility of being challenged or questioned at a later date, increasing their irreversibility (Callon, 1991, Holmström and Robey, 2005). For instance, once a bus network is built, moving its bus stops becomes very complicated.

It is not possible to know beforehand the success of an inscription, but by studying its sequence of attempts we learn more about exactly how and which inscriptions were necessary to achieve a certain goal (Hanseth and Monteiro, 1998b). Latour (1991) gives a clear example that illustrates this aspect of ANT. A hotel manager wanted the guests to leave their keys at the reception desk when leaving. Often keys were lost, which was costly for the hotel. Initially, the manager asked the customers to leave their keys as they left. The desired response was not achieved. He, therefore, tried to inscribe his aim in the form of a notice behind the counter, requesting all guests to deposit the keys when leaving, which also failed. The next inscription to be attempted involved a key with a metal knob with some weight. By stepwise increasing the weight of the knob, the desired behavior was achieved. Making the key knob heavier strengthened the inscription. Hotel customers were more than willing to get rid of an unnecessary and cumbersome weight.

Hanseth and Monteiro (1997) argue that unanticipated events and opportunistic choices are always happening, creating more complex scenarios than those of Latour's example of the hotel keys. These uncontrollable factors make it very complicated to forecast exactly what it takes to make an inscription strong enough; it is a matter of practical trial and error (Hanseth and Monteiro, 1997). As Law (1992) illustrates, "Walls may resist the escape attempts of prisoners – but only while there are also prison guards". In other words, the strength of an inscription does not depend exclusively on the inscribed artifact, but on the network to which it belongs.

Another interesting feature of inscriptions is their ability to enable action at a distance by creating artifacts that can travel across space and time and thereby influence other practices (Latour, 1987). For instance, laboratory rats might give rise to an inscription device. They "would be sacrificed to produce extracts which would be placed in small test tubes. Then, those test tubes would be placed in a machine, for instance a radiation detector, which would convert them into an array of figures or inscriptions on a sheet of paper. These inscriptions would be said – or assumed – to have a direct relation to 'the original substance'" (Law, 2004, p. 20). The developed practices make it possible to manipulate rat characteristics based on the obtained inscriptions, since they have a direct relationship with the analyzed material.

In addition, inscriptions can circulate around the world, as shown in “Pandora’s Hope” (Latour, 1999b), in the chapter on the “Circulating Reference” that follows the work of scientists in the Amazonian forest of Brazil, in the area of Boa Vista. The purpose of the expedition was to determine whether the Boa Vista Forest was advancing into, or retreating from, bordering savannah regions. The scientists translated the soil on the border between the forest and the savanna, through a number of intermediate transformations, into diagrams that substituted the original situation (Latour, 1999b). In other points of the globe these diagrams can continue to suffer transformations and new inscriptions can be constructed based on the work of scientists who intend to contribute to the clarification of this issue.

In fact, what is manipulated is neither the rats themselves nor the Amazon soil, but scientific notations derived from inscription devices that establish a link to them. In this process, the materiality of the performed transformations gets deleted along the way (Latour and Woolgar, 1979). The intermediary steps (e.g., the actions performed, the materials analyzed) are not taken into account in discussions about what the inscriptions mean. As argued in (Latour and Woolgar, 1979) the process of producing the traces melts into the environment, the patterned stabilities of translation are progressively eroded.

One of FoodAtYourDisposal’s goals is to motivate its customers to pay in cash, in order to avoid back fees. The success of this inscription depends on the achieved network alignment. To convince its customers, HereForYou decided that it would create a customer loyalty card to accumulate a point for each euro spent in cash, and 100 points would be equivalent to an offer of 5 euros. Successive attempts to inscribe the desired behavior can be performed until the inscription is accomplished.

3.3.6 Black Box and Punctualization

In ANT’s world, when an actor-network is stable (has practices that are widely performed) and starts to behave as one entity independently of its complexity, it is turned into a black box. When this happens, it renders invisible the complexity that constitutes it (Cressman, 2009). A black box “contains that which no longer needs to be reconsidered, those things whose content have become a matter of indifference” (Callon and Latour, 1981, p.284). Black boxing can seal entities such as social groups, procedures, and materials taken for granted in the process of heterogeneous networking. In spite of its characteristics, it is worth mentioning that it is possible to open a black box by moving it in time and space until a controversy that can compromise the black box is found (Latour, 1987). For instance, poor labor relationships can jeopardize workplace agreements, or betrayals in previous partnerships can affect the regulations of future cooperation protocols, imposing the reopening of the black box.

The concept of punctualization was introduced to handle cases when complex actor-networks that become stronger and stable are black boxed and linked to other networks. This concept underlines the idea that everything is both an actor and a network and provides a way of simplifying actor-networks, avoiding endless complexity (Law, 1992). Sometimes it is advantageous to notice individual entities, while in other situations it is appropriate to consider patterned networks. For example, when journalists visited the farm at Pouilly le Fort, they saw some sheep dying of anthrax, while others, healthy, grazed in infected fields. Pasteur explained that moribund sheep had not been vaccinated, whereas the others had. Since there were no dissident voices (the sheep did what he said), Pasteur, in that particular instance, had represented the network, and punctualized it (Callon and Law, 1997). This is more than can be said about EDF, since the electric car project lasted only a few weeks before it started to collapse. The vehicle never reached a steady state of stability due to the controversies among the actors, who did not agree with the translations performed by EDF.

It is, however, important to stress that punctualization is sensitive to change. As presented in (Callon and Latour, 1981) all black boxes are leaky, since they are exposed to initiatives that can compromise their punctualization. This idea is also reinforced by (Law, 1992, p. 5), according to whom punctualization is always precarious, faces resistance, and may degenerate into a failing network. In short, black boxes can be open and their content examined.

In the FoodAtYourDisposal business model, people in charge of the deliveries carry GPS-enabled smartphones that send their positioning to the portal. This can be used in conjunction with the locations of the clients and the restaurants to assign the closest employee for the delivery. The inner complexity of the algorithm of this portal's feature was black boxed and made opaque to its users. HereForYou, which developed the portal, expects to sell it to others.

3.3.7 *Immutable mobile and multiple realities*

Latour (1986b) approaches the concept of immutable mobile in a story about La Pérouse's travels through the Pacific Ocean. He was assigned, by Lois XVI, the mission of increasing the French cartographic knowledge in that area. One day, he landed and asked the local natives if the bit of land they were on was an island or a peninsula. In response, an elderly native man drew a map of his island on the sand. Another native, who observed that the rising tide would erase the map, drew it in one of La Pérouse's notebooks. What was for the natives an insignificant drawing, for the French was the object of their mission, which many people in Versailles were anxious to get.

According to Latour (1987), the map is an immutable mobile. It is something that moves freely around, with the capacity to hold its features. La Pérouse intended to bring the inscriptions of the landscape, so that the people in France could visualize this distant entity (the real island) and then travel back if necessary. A variety of elements had to be brought in coordination to gather the necessary conditions to accumulate those means in what was called a centre of calculation. Centers of calculation (e.g., laboratories) refer to the sites of transformation, that is, the location where immutable mobiles are managed: they are drawn together, summarized, assembled, and calculated.

As Law and Mol (2003, p. 2) put it, "scientific findings and theories are made in specific locations. They are always made somewhere. In a locality. They are regional, not universal". However, immutable mobiles make long distance control a possibility (Law and Singleton, 2005). This depends on the networks' relationships ability to secure immutability on the one hand, and mobility on the other. In (Law and Mol, 2003) this argument is illustrated with the Portuguese vessels from the fifteenth and sixteenth century. Except for some unfortunate accidents, in general the vessels held together as they moved from Portugal to India and returned. They maintained their physical shape, and their network sustained itself in a stable manner. This network included, for instance, the Atlantic Ocean, winds, sailors, the Muslims, European enemies, the spice, sails, navigation devices, and the Portuguese crown's currency.

Immutable mobiles possess two forms of spatiality: Euclidian space and network space (Law and Mol, 2003). The former is defined by a set of three-dimensional coordinates (if the vessel is tied up in a harbor it does not move, if it is navigating it moves). The latter addresses the relationships between the vessel and the remaining elements of the network. If they do not suffer modifications, then the vessel is immutable in the network space. As Law and Mol (2003, p. 4) state: it is the "immutability in network space which affords the mobility in Euclidian space".

In some situations, other visions of spatiality are demanded. For instance, when a particular technology is developed its behavior is specified, its aims are defined and expectations are created. However, the network's relationships created around the technology may diverge from what was initially planned, compromising (or transforming) the technology role and the established expectations. Marianne de Laet and Annemarie Mol (2000) explored this situation with the case of the Zimbabwe bush pump. This device was widely accepted by the villages that needed a new water pump. As time went on, the pumps broke down and the villagers tended to replace their components with whatever could substitute them, due to the scarce resources of the population. The physical shape of the pump changed in each village where the pumps were enrolled, as well as its components. It is not an invariant shape either in Euclidian or in network space (there are reconfigurations to keep the pump working). For the described reasons, the authors defend that the pump is best understood as a mutable mobile.

A relevant question raised by the previous study addresses the failure (or not) of the original pump. Its creator happily accepts the "multiple realities" created through the variability of the artifact, since they reinforce the chances for the pump to work. For this reason, it is plausible to abandon the idea of failure and to account for technology as fluid objects that can be adapted to new demands and networks. Nevertheless, the idea of "multiple realities" goes beyond the continuous transformations in fluid objects. It considers that any object can be enacted in multiple practices and can be reshaped by each, which can make it difficult to obtain an entire account of the object (Law and Singleton, 2005).

In FoodAtYourDisposal the reports and graphics that are created based on the activities inscribed in the business model are examples of immutable mobiles. If an equivalent business model was implemented in another city, in which the farmers' production of potatoes, eggplants, and garden cabbage was enough to satisfy the needs of all the restaurants in that city, different protocols could be established to promote the cooperation between both. In this case, changes would be introduced in the business model.

3.3.8 Intermediary versus mediator

Actors communicate among themselves through intermediaries. These provide the means to translate the actors will into the others' and to define their positions in the network. An intermediary "passes between actors in the course of relatively stable transactions." (Law and Callon, 1992, p. 25), supporting network connections. It can be, for example, a text, a graph, a service, a product, a person, or money.

Latour, in a later phase (Latour, 2005), felt the need to make a clear distinction between what he designated as intermediaries and mediators. An intermediary "transports meaning or force without transformation: defining its inputs is enough to define its outputs." (Ibid., p.39). While a mediator's input "is never a good predictor of their output; their specificity has to be taken into account every time. Mediators transform, translate, distort, and modify the meaning or the elements they are supposed to carry" (Ibid.). Intermediaries, independently of their complexity, have an expected behavior, while mediators, even if they are apparently simple, can reveal themselves extremely complex.

It is not easy to establish the nature of a particular entity. For instance, a functioning software program can be seen as a complicated intermediary while a department meeting may possess a chain of mediators, where beliefs and feelings can diverge in multiple directions. However, if one module of the program breaks down, it may turn into a dreadful complex mediator, while a department meeting can become a perfect intermediary in transmitting, for instance a CEO's decision. This uncertainty around the behavior of an entity, that can either be an intermediary or a mediator, depending on the circumstances, is at the genesis of ANT's principle of following the actors and their practices.

The portal used in the FoodAtYourDisposal business model can be seen as an intermediary, while the actors that negotiate additional agreements of exclusivity with the local farmers can be regarded as mediators (e.g., farmers, restaurant's owners, and the company HereForYou). Each one has interests that may not converge.

3.3.9 Power

ANT provides innovative lenses to understand the nature of power. In ANT, it is assumed that actors do not have inherent qualities (Law, 1999). Based on this interpretation, the power of an actor is something that should not be defined *a priori*, but an emergent characteristic that should be understood and explained as a result of network relationships. ANT demystifies the power of the powerful (Law, 1992), since no difference is assumed among the actors (e.g., between the powerful and the weaker) - they are treated equally.

The manifestations of power come to light from the network translations and inscriptions. Being powerful does not automatically confer to an actor the ability to induce change, unless other actors can be persuaded to perform the activities that can support that occurrence (Latour, 1986a). As Hernes (2005, p. 117) argues, translation can be regarded as "negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force". When inscriptions result from the translation process, as argued by (Rolland and Aanestad, 2003, p. 20), these manifestations are "delegated to material structures and thereby made durable". To identify power manifestations, it is important to establish how interactions succeed in stabilizing themselves, how they defeat resistance, and how they give rise to power.

To analyze the power of any type of organization, individual, country, or technological innovation is to understand their connections in a network of heterogeneous actors. Power, as mentioned, cannot be defined at an initial stage; it is something that can only be assumed after explaining how it is performed and made durable (Cressman, 2009). It can be understood as an effect, rather than a cause. Power has a dynamic condition, as Latour (1986a, p. 268) puts it, "Power is always the illusion people get when they are obeyed (…) people who are 'obeyed' discover what their power is really made of when they start to lose it. They realize, but too late, that it was 'made of' the wills of all the others". Empires may collapse, politicians may lose their influence, or a mafia leader may be deposed.

Willcocks (2004, p. 255) argues that power "must be analyzed as something that circulates". It should be conceived as a practice that changes according to the network conditions. Actors can modify their interests and decide to cooperate in innovative ways, enrolling other actors – both human and non-human in order to strengthen their positions in the network. Power reflects the capacity of exercising influence on others, which can lead to durable and successful networks.

In FoodAtYourDisposal, we try to perceive the actors' ability in manipulating the network according to their own interests. The gathered intelligence can reveal who is better positioned to enroll and lead others, as well as shape the business model's aims.

3.4 Why seek inspiration in ANT

The literature review on business models (Chapter 2) collects the most cited definitions, components, and representations on the subject, which gave us the necessary background to detect relevant topics to their study (e.g., available value propositions, involved actors, their interactions and partnerships, business flows, performed activities and allocated resources). It also underlined the importance of accounting for the influence of the social context in which a business model is developed and implemented in its study (Monteiro, 2000, Pateli and Giaglis, 2004, Hoegg et al., 2006). In addition, we observed that many of the available proposals did not focus on the study of networked business models, but on the business model of a particular organization. When the complexity of network configurations is taken into account it becomes even more relevant to integrate the social dimension of the business model in their study. A comprehensive view can promote their understanding, discussion, and definition, creating favorable conditions to a more reliable translation of the business models' requirements to their underlying information systems.

When formulating and analyzing business models, uncertainty is present in the majority of the settings (e.g., it is difficult to fully predict the emergence of groups, or the consequences of performed actions). ANT can aid to reveal scenarios that are not so obvious or not completely clear. It can provide the knowledge to explore why some networks are not able to stabilize and collapse while others flourish and become the starting point for other networks. According to Latour, ANT is a way of starting inquiries on the basis of uncertainty (Gad and Jensen, 2010). In spite of the fact that ANT does not aim at forecasting behaviors, the insights obtained through its use can provide important clues to a business model study. We used its principles in BIZ2BIS to place all the network elements in their proper context (Peppard and Rylander, 2006) and to go beyond the study of direct connections between the actors. ANT provided us with an inspiring background to collect data on the networked business model, to define and organize attempts to align the interests of the actors, and to include the social context of the network, as well as of its elements, in the high-level requirements of the underlying information systems.

ANT offers an enlightening vocabulary that describes how the actors come together to create a network, explores how its relationships are composed, how these emerge and are maintained, the existing diversity of flows, how the actors compete among themselves, the established agreements, and how networks are made durable over time. Its aptitude to analyze actors' associations reveals tactical insights (such as anti-programs) and clarifies the value provided by the actors. The obtained data is a wealth of information on networks. Business model theories already point to the importance of covering business model interactions, but ANT's inspiring outlook led us to go beyond that.

Frequently, networked environments need to be subject to an evaluation process (e.g., to understand if the model is profitable or productive or to verify if investments are being well applied). As stated in (Rogers et al., 2001) and (Mote et al., 2007), to translate what we know about networks into a framework for evaluation is not as straightforward as we would like it to be. For this reason, the analysts usually rely on an evaluative model that is dependent on network inputs (e.g., human resources or money) and outputs (e.g., products, patents, or documents) (Cressman, 2009). This appraisal can produce important insights, however shuts its eyes to the network connections and the specificities, nature, and strength of the established relationships. Each actor is assessed individually and the network relational space is not contemplated, thus ignoring the idea that a network, as a whole, is greater than the sum of its parts. We believe that ANT's ability to concentrate on each actor and on the network as a whole, while considering technical and social merits, can help us understand what happens between inputs and outputs of networked business models and enhance its evaluation mechanisms. To shed more light on the network complexity, in addition to commercial transaction and information exchange, we also detailed flows as collaborations, conflicts, brand loyalty, or prestige.

ANT showed us a world of associations and relations, without considering distance or measurement. We used it to guide our view of networked business models. Therefore, we have translated its principle of following the actors to the business model domain, zooming in and out to meet the purposes in question and reducing the fuzziness of the network boundaries. According to ANT's main proponents, researchers should "follow the actors" through their connections

(Callon, 1986a, Latour, 2005) and begin the "travel by the traces left behind by their [actors] activity of forming and dismantling groups" (Latour, 2005, p. 29). As Masys (2010) states, based on Latour (2005, p. 81), following the actors' allows the researcher to investigate those that have been "silenced or deleted" and "to bring them back to light by using archives, documents, memoirs, museum collections". The main tenet is to "let them [actors] set the framework and limits of the study themselves" (Tatnall and Burgess, 2002, p. 184). This principle inspired us to iteratively search for new actors and obtain a comprehensive vision of the network in our approach.

ANT recognizes that "what is acting at the same moment in any place is coming from many other places, many distant materials, and many faraway actors" (Latour, 2005, p. 200). This perspective of time and space motivated us to look for the unobvious and reinforced the already identified importance of comprehending the business model context and its dynamics. It inspired us in developing mechanisms to detect changes that could potentiate or compromise the network and point out alternatives to explore the former and diminish the latter.

ANT's concept of translation was also a major contribution to the development of BIZ2BIS. We used it as the starting point to the specification of a set of steps to trace and assist the social process of negotiation among the network actors, redefining and appropriating interests back and forth between them. Our aim was to discover what could compromise the network and identify what could promote its actors' interests - how they could be involved, what could strengthen their presence in the network, how business model alignment could be achieved, and how it could be maintained. The ability to disclose clues for future attempts of alignment is grounded in the detailed information captured on the actors' relationships, as proposed by ANT. The iterative nature of the study intends to saturate the description, to bring explanation into view (Latour, 1991), improving visibility over the interplay of interests. The comprehensive vision of the network integrated in our approach gears it towards a bottom-up negotiation mechanism to tune the most fragile parts of the networked business model and ensure sustainable interest from all the actors.

In networked business model settings, what seems at first glance to be social is partly technical, and what may appear to be only technical also has social influences. ANT deals with this socio-technical account by denying that purely technical or purely social relationships are possible and proposes the application of the principle that networks are materially heterogeneous (Tatnall and Gilding, 1999). Through ANT's lens, human and non-human actors emerge as a "hybrid collectif" (Callon and Law, 1995). This concept avoids the distinction between what is social and what is technical and allows ANT to center its attention on the associations among actors (Latour, 1988b). Therefore, ANT's ability to view a network as a collective of human and non-human actors in a continual evolving entanglement (Grabher, 2006) gave us the background to take into account in BIZ2BIS the role that non-human actors possess in networked business models. It allowed us to consider actors like standards, governmental laws, or underlying information systems, the latter being of particular interest for our research.

There has been an increasing interest in the use social theories in the information systems domain. In particular, considering ANT's contribution, since the mid 90s several studies have drawn upon it, showing its potential to describe the information systems' role in several domains. For instance: information infrastructure standards of patient record systems in hospitals (Hanseth and Monteiro, 1998a), the evolution of EDI messages to support the definition of the Norwegian standards for the health sector (Monteiro and Hanseth, 1996), analysis of a geographical information system in a district-level administration in India (Walsham and Sahay, 1999), standardization of project activities developed in Ericson (Linde et al., 2003), cooperative use of IT (Underwood, 1998), implementation of a business-to-business portal for regional SMEs in Australia (Tatnall and Burgess, 2002), online analytical processing tool in a municipal organization in Sweden (Holmström and Robey, 2005), development on information technology project escalation (Mähring et al., 2004), and standardization and integration in the implementation of industry inter-organizational information systems at the seaport of Barcelona (Rodon, 2007).

It is essential not to explain information systems based on a fixed set of independent factors (McMaster et al., 1997a, Lyytinen and Damsgaard, 2001). On the contrary, it is important to take into account the complex relationships between information systems and the networks on which they operate and the interplay between different actors (e.g., people, technologies, standards). According to Doherty and King (1998) and Graham (2008), social factors are, in many cases, more responsible for information systems failure than technical ones. The interplay between the social and the technical can stimulate new forms of thinking information systems. ANT's language aided us to perceive how information systems influence – and are influenced – by business network contexts, and inspired us to analyze their connections in an innovative way, regarding the expectations that the remaining actors put on it.

When the arrangements established in a network result in the alignment of its actors, their interests are translated in accepted programs of action that can be inscribed in information systems. The concept of inscription inspired us to include in BIZ2BIS the ability to transfer knowledge acquired on human actors to the non-humans, revealing how human interests are materialized in non-humans. These non-human actors can be used as delegates for specific goals, and they are complex enough to hide decision processes, concealing the way that social interests are represented (Holmström and Robey, 2005) in business models. ANT's principles offered us the potential to reveal technical complexities and contingencies often overlooked. The obtained knowledge can be used to provide additional clues on the information systems suitability, increasing its chances of acceptance and success.

BIZ2BIS adopted a socio-technical account mainly inspired by ANT. Its principles guided us to complement the description of business models in network configurations with their social context, which aided us to define the data that could be relevant to understand the network. The concept of translation was used as the starting point to develop sensitive devices able to point out hints on how to enroll actors, thus increasing the chance to develop successful business models. The integration of ANT's outlook in BIZ2BIS and the knowledge acquired under that perspective created an awareness of how information technologies could be included, and used, in a networked business model. Moreover, it disclosed valuable clues on how to explore the information systems' role in the development of an innovative and viable business model (e.g., understanding actors' expectations and reactions). The established symbiosis increased the chances of developing information systems that can cope with business model demands.

3.5 From description to action

As explained so far, ANT can meticulously describe network relationships and the continuous search for alignment. To achieve this purpose, ANT is considered to possess a set of dictums, designated as "Rules of the Method" (Latour, 1987, p. 258), which guides its analysis. Nevertheless, in what concerns ANT's practical implications, the available literature is somewhat disappointing, since most texts do not explain how to go about doing ANT. It does not provide a narrative that can help identify the network's problems, nor does it produce an exact rendering of the state of affairs that can guide analysts throughout future actions to promote the network or avoid possible drawbacks. For the ones that search for practical guidelines, there is the idea that an enigmatic ANT method is still at work behind the scenes (Gad and Jensen, 2010).

BIZ2BIS aims to analyze and evaluate business models to create a stable network of interests able to strengthen its viability. If required, its outcomes can be used to act and change the setting being study. Although ANT has not been conceived to provide outcomes to plan and manage an intervention (Lewis, 2007), based on the arguments presented in the previous section we believe that ANT can have a clear contribution to our search for alignment among the business model's actors. By describing in detail the network in which a business model operates, ANT can help explore the questions of how and why we have the business models that we have. Its principles can be used to interpret current problem settings, to disclose interventions and to forecast its possible results. ANT's philosophy can provide an inspiring background to collect data on the networked business model, identify its actors, define the network boundaries, organize attempts to align the interests of the actors, and take into account the social context of the network in the specification of the high-level requirements of its underlying information systems. The knowledge offered by ANT can aid to avoid treacherous situations, augmenting the chances to enhance the stability and performance of networked business models.

The integration of ANT's concepts in an approach whose outcomes may be used to intervene in a scenario under study demands to look at it in a new analytic perspective. Note that ANT's adoption under the described scope remains open to researcher's imagination and is not prescribed by ANT's proponents. However, according to Law, "Only dead theories and dead practices celebrate their self-identity. Only dead theories and dead practices hang on their names, insist upon their perfect reproduction" (Law, 1999). Also Latour describes ANT as a very crude method (Latour, 1999a). This sustains the idea that ANT cannot be reduced to a standard approach that can be universally applied (Cressman, 2009). As Latour mentioned, ANT's definition, like any other definition, is "in the hand of later users" (Latour, 1987, p. 29). In our research, we borrowed its ideas and developed efforts to integrate them in our approach, by molding them to our needs.

ANT's insights enabled us to capture the complexity of business scenarios by providing the means to interpret instances of the network formation and evolution. Its descriptive capabilities conducted our reading of the business model setting and helped us develop measures to identify the actors, follow their footsteps, describe their relationships, as well as the attempts to seek an alignment, and regard the dynamics of the business models. However, our approach does not intend to produce just a detailed description of a story. We want to provide prescriptive advice for operational use and outcomes that can be used to act on the business model.

Actors have the power to appropriate, ignore, modify, or betray the network goals, and their different sensibilities may cause drift tendencies. The need to align stakeholders' interests or to make continuous adjustments demands that the business model goals be re-assessed and modified as the requirements arise. The information obtained from ANT, and ANT itself, can be used to guide the process of sensitizing the would-be-problems and provide information to reflect on how to make (or not) an intervention. Regrettably, and in spite of the enlightenment ANT can offer, it is not able to contribute beyond description (Lewis and Townson, 2004, Cressman, 2009). The aim of providing outcomes to intervene entailed the establishment of a breaking point with ANT's principles at a certain stage in our approach.

To provide outcomes that can be used to act on the networked business model, we applied ANT's concepts from a different angle. Instead of using the translation's concept to describe, we applied it to discover procedures to follow during the study of the business model. We did not use its four phases to describe how an actor was attracted and enrolled, but to guide our judgment on which actors to enroll and on the best way to attract them. The obtained intelligence is supported by all the data gathered on the network. ANT's inspiration provided our approach with a descriptive component that progressively evolves in a proactive way to intervene in the business model. Despite pointing out interventions through our approach, the actors with power to decide the business model's future options always have the final say on what to do about the proposed suggestions.

As described, we want to assign an active role to ANT that overcomes its descriptive nature. In our opinion, some researchers have already given the first steps in this direction. For instance, Callon (1986b) details how three French scientists, who tried to domesticate scallops in St. Brieuc Bay by applying a technique observed in a trip they made to Japan, are successful in molding an "actor-network". In this process, the author provides practical guidelines to distinguish translation phases. Holmström and Robey (2005) investigated the organizational consequences of the introduction of an OLOP tool in the Municipal Government of Umeå (a city in northern Sweden). The outcome of their study had a set of statements with an interventionist nature (adjusting the application to the specific needs of each department, providing training sessions, and performing adaptations to serve the actor's interests). Dunning-Lewis and Townson (2004) used ANT's concepts to think about how to organize change in a Corporate Banking working practice. These authors observed the utility in using ANT's ideas as a language for discussing and planning interventions.

3.6 Complementary aspects to ANT

ANT has limitations when accounting for all the relevant aspects that may influence networked business models. For example, it cannot properly deal with how organizations shape actions in the network at the same time as the very same actions mold the organizations (Monteiro and Hanseth, 1996). Latour would probably argue that if certain contextual influences were not covered by ANT that was due to the fact that the description was incomplete and that extra enquiries should be done to clarify certain issues. In ANT no assumptions about the actors are recognized a priori - actors' properties are seen as network effects, rather than causes. The descriptions should stem from the case, not from generalized theories (Nijland, 2004, p. 244).

We agree with Brooks and Atkinson (2004) that networks are not maintained solely through the often Machiavellian stratagems of the focal actors who brought them into being. There are mechanisms inherent in the routine of the relationships perpetrated in a network. When studying business models in the field, we were able to notice how aspects such as norms, standards, politics, and shared interpretations influenced the actors' behaviors. Our awareness of their influences enhanced our knowledge on the context under study, aided to perceive the networked business model, and supported actions over it. For instance, due to the total lack of information concerning mechanisms behind the development of scallops, a biological theory would have helped to understand their behavior in the classic ANT study of scallops' domestication in St. Brieuc Bay (Callon, 1986b). ANT can explore these effects through new enquiries that have as its focus the clarification of network particularities, frequently in the form of black boxes (for instance, a standard). However, this investigation demands a laborious effort, since new black boxes can arise, disclosing a continuous and endless task - it is very difficult to recognize when to stop and to identify the black boxes that are really worth opening.

In the early stages of a business model study, we consider it advantageous to obtain a starting point that addresses the intrinsic structures that bind the actors together and influence their interactions. To address this need, we inspired ourselves in the tenets of Structuration theory and integrated its topics in our research. We are not pioneers in using Structuration Theory and ANT together. Authors like Walsham and Sahay (1996), Brooks and Atkinson (2004), Macome (2002), and (Naidoo, 2008) also followed this path. For instance, Walsham and Sahay (1996) used both to investigate problems in developing geographical information systems (GIS) in an Indian government department. These authors analyzed the social context and the process of implementing GIS in India, as well as the inter-linkages between both. Similarly to what we will do, Structuration Theory was used in the early part of their study. It was applied to clarify aspects of social context related to the government organizational structures and the Indian scientific tradition. The obtained outcomes were used to support the initiation, operationalization, and continuation phases of the GIS implementation process (mainly covered through ANT). At a later stage of our research, we noted that similarly to Structuration Theory, the concept of Social Capital could also provide additional insights on the network context, in particular in the characterization of the relationships. Both are succinctly described in the next two sections.

3.6.1 Structuration Theory

This section provides an overview of Structuration Theory. For this research, it is applied in order to gain understanding on the social, organizational and personal contexts in which business models are embedded.

Structuration Theory was proposed by Giddens (1979, 1984). It studies social phenomena at a high-level of abstraction, offering a descriptive view of the world, rather than an explanation of its mechanisms (Jones et al., 2004). The theory's aim is to account for the interplay between social structures and human action (Monteiro and Hanseth, 1996). People, upon reflection on their day-to-day activities, are able to draw upon social structures by either reproducing current practices or by changing them. Simultaneously, action is both constrained and enabled by structure.

The key concepts of Structuration Theory are agency and structure. Human agency represents the capacity to make a difference and describes the actors' actions. According to Giddens (1984, p.14), it is "the capacity to make a difference", also known as "transformative capacity". On the other hand, structure is defined as rules and resources implicated in social reproduction (Giddens, 1984), organized as properties of social systems. The notion of "structure" is to be conceived as an abstract one. Giddens describes it as "memory traces" orienting the conduct of knowledgeable actors (Giddens, 1984).

Agency and Structure are dependent upon each other and recursively related. All social activity, including work processes, can be viewed as enabled and constrained by social structures that are produced and reproduced via human agency (Lyytinen and Ngwenyama, 1992), but structure is also enacted by human action. Structure is more than an exogenous restraining force, it is also a resource to be deployed by humans in their day-to-day actions: it is enabling as well as disabling (Jones and Karsten, 2003). Social structure and human interaction are broken down into dimensions (presented in Figure 20) and their recursive character is illustrated through the connecting modalities. Its division into vertical dimensions is an analytical device; in practice, as exposed in the following section, they are inextricably interlinked (Jones and Karsten, 2003).

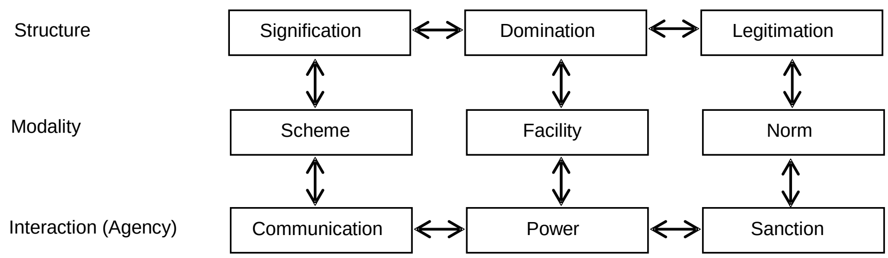


Figure 20: Dimensions of the duality of structure

Source: Adapted from Giddens (1984).

Giddens (1984) identified three dimensions of structure, which he termed signification, domination and legitimation (Figure 20). Signification refers to the rules that constitute meaning, while legitimation addresses the resources and norms that determine relationships of domination. These dimensions interact with human actions of communication, power, and sanction.

The mutual interchange between agency and structure is mediated through a linking device called modalities that considers three types, namely interpretive schemes, facilities and norms. These modalities are the locus of interaction between the knowledgeable capacities of actors and the structural features of social systems (Jones and Karsten, 2003). Since this relationship is mutual, the modalities work both ways. According to Giddens (1984), interpretive schemes denote the shared stock of knowledge which humans draw upon when interpreting situations (tacit and explicit); it enables shared meaning and communication (for instance, language can work as an alignment vehicle, able to contribute to network cohesion). It may also be the reason why communication processes are inhibited. In applying Structuration Theory to IT, (Orlikowski and Robey, 1991, p. 155) note that "software technology conditions certain social practices, and through its use the meanings embodied in the technology are themselves reinforced". In Structuration Theory, human actors base their communication on interpretive schemes to support interactions. However, these interactions can simultaneously modify the interpretive schemes that are embedded in social structures as “signification”. The exercise of power plays an important role in the exploitation of resources, which produces and reproduces social structures of domination involving resource authorization and resource allocation. Authoritative resources derive from the coordination of human agent activity, while allocative resources stem from control of material items (Orlikowski and Robey, 1991, p. 155).

The sanctions applied in human interactions are supported by norms (e.g., protocols), which iteratively produce structures of legitimation. Norms conduct social practices through the mobilization of sanctions. While interpretive schemes are the rules for understanding what to know, norms can be perceived as the rules for realizing how to act. As a result, they define the legitimacy of interaction. They are created through continuous use of sanctions. Besides engaging these rules, the capacity to act also depends on resources. Facilities, in turn, comprise the resources through which power is exercised over social action and enable to draw on and reproduce structures of domination.

These concepts may be illustrated by considering the example of a familiar confectionery that started its activity in the beginning of the twentieth century. Its present owners follow the same recipes, to the exception of minimal adjustments proposed by some pastry-cooks that worked in the company. These modifications can only be implemented if approved by the owner (structures of domination). In terms of structures of legitimation, it may specify restrictions on the quality of the ingredients – use of natural products only, or transgressions that may invoke sanctions. Structures of signification may include the shape of the cake and the employers’ dress code. These structures are sustained or can be altered by the day-to-day actions of those involved in contemporary confectionery life. For example, a new recipe may be proposed and accepted.

When humans analyze and mobilize existing interpretive schemes, they acquire knowledge to act. Since humans possess the capacity to reflect on their own actions, they can decide on the maintenance or change of the existing behavior. These practices highlight the patterns that constitute society, or try to establish new ones (through schemes, facilities and norms) that will, if accepted, institutionalize new characteristics in the social structures (Brooks and Atkinson, 2004, Ferreira, 2004).

Schultze and Orlikowski (2004) perceived a similar dynamic in the case of network relationships. According to these authors, regular interactions and actions of organizations draw on a variety of assumptions, expectations, norms, and protocols of interaction, information exchange, reciprocity, and governance. We can see business models as a social product of subjective action influenced by specific structural and cultural contexts, and simultaneously a set of rules and resources involved in mediating action, hence contributing to the transformation of those contexts. Several researchers, for instance Orlikowski and Robey (1991) and Schultze and Orlikowsk (2004) explored how specific elements and functions of information systems relate to organizational issues (namely, inter-firm relations). On our part, we intend to use the dimensions of the duality of structure (illustrated in Figure 20) to explore the dependencies between business models and their contexts.

3.6.2 Social Capital

According to Nahapiet and Ghoshal (1998, p. 243) Social Capital is "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit". It thus comprises both the network and the assets that may be mobilized through that network. Putnam (2000) popularized the terms bonding Social Capital and bridging Social Capital. Bonding Social Capital focuses on the internal structure of a community or an organization. Bridging Social Capital, on the other hand, tries to explain how the activation of external social relations to individuals or collectives may promote successful action.

Social Capital can be mobilized to facilitate individual and organizational activities. It can take the form of mutual trust, goodwill, obligation, and reciprocity in embedded relationships (Adler and Kwon, 2002). Like human and economic capital, it can be exchanged by other types of capital and can provide returns if properly managed (Bourdieu, 1986). For instance, a restaurant may rely on the loyalty of their long-standing customers to provide more affordable menus. This type of capital is not property of a particular actor but is embedded in the relationships. If the relationships die out, Social Capital is no longer nurtured and consequently fades away (Adler and Kwon, 2002). For example, if the chef, who knows the preferences of his/her clients and cooks based on that awareness, decides to abandon the restaurant for which he/she works, it is likely that the goodwill and trust created with the clients will leave with the chef.

Nahapiet and Ghoshal (1998) have characterized Social Capital in terms of three interrelated dimensions: structural, relational, and cognitive. They were taken into account to ascertain if we were eliciting the necessary and suitable topics in the characterization of the business model's relationships in network environments. While the structural dimension is concerned with the overall pattern of institutionalized connections between actors in a network, which covers aspects such as network ties and network configuration (Hatzakis et al., 2005), the cognitive dimension addresses the need for a common context and language. On the one hand, the structural dimension's focus of attention on network configuration reinforced our understanding that Social Network Analysis (Wasserman and Faust, 2008) can provide interesting insights to our framework. We were already alert to this, based on business model literature (section 2.2). On the other hand, the cognitive dimension supported Structuration Theory's insights. In turn, the relational dimension covers the dynamics between network elements. It deals with the levels of mutual trust and reciprocity (Svendsen and Laberge, 2005) and encompasses norms, social sanctions, mutual obligations, political views, expectations, and perceptions of social identity (Hatzakis et al., 2005). This information caught our attention towards the importance of understanding the nature of the relationships among the actors (e.g., reliance, conflict, or indifference). It underlined the importance of including in our approach sensitizing devices to perceive the actors' interests, cover their individual expectations, and explore forms of collaboration.

Structuration Theory and the concept of Social Capital can contribute by clarifying business models issues that are not the focus of an ANT study. Structuration Theory captures the essence of the structure in which a network exists, which allows a better understanding of its interactions and activities and the perception of the aspects that may influence actors' behavior (Phillips et al.). In turn, Social Capital contributes to take the pulse of network relationships, exposing signs of trust or conflict that can be used to support the understanding of the future network dynamics.

3.7 Outcomes from the social domain

ANT was our main source of inspiration, but we also gathered helpful contributions from Structuration Theory and from Social Capital. There are no divergences or contradictions in the combined use of ANT and Structuration Theory, since they were separately applied in order to address different, yet complementing issues (Brooks and Atkinson, 2004, Iyamu and Roode, 2010). The same philosophy guided the contribution made by Social Capital. To compare these influences and contrast their socio-technical stance is not an aim of this research. Instead, we highlight their individual contribution and complementary usefulness, which aided us in gaining knowledge on the enabling and restraining influences of human and non-human actors in the conception, development, and implementation of networked business models. Their combination also allowed us to integrate alternative perspectives over the same scenario and additional types of explanations in our approach.

In BIZ2BIS, the inclusion of topics inspired by the mentioned three social influences was black boxed to the users. Structuration Theory's and Social Capital's tenets were mainly included in the initial phase of our approach with the aim of guiding a broader social analysis of networked business models. ANT's influences, in turn, promoted a more fine-grained analysis of the interactions among the actors, those being individuals or technology. ANT led us to expose how technological decisions are interwoven with business model issues and enabled us to endow our approach with the ability to be more specific with respect to the functions that the information system could play in a given business model scenario.

Our focus on business models' underlying information systems is not covered by Structuration Theory, which does not consider technical components and does not provide guidelines about its application to information systems (Monteiro and Hanseth, 1996). According to Giddens, structures only exist in people's minds. However, modalities can manifest themselves through artifacts: in documentation, in formalization of actions, as well as in formal and informal rules of behavior (Brooks and Atkinson, 2004), which makes them the most attractive places to include technology in Structuration Theory (Orlikowski and Robey 1991). Similarly to Structuration Theory, Social Capital is not specific about technology, but artifacts can embody aspects of its dimensions (e.g., norms, sanctions, and common codes). The mentioned artifacts can be used as a link to the business model domain, underlining the symbiosis between the theoretical contributions that inspired this research.

The role given to artifacts in a networked business model can be disclosed and detailed by ANT's ability to handle non-human actors as just another actor. In many cases, the artifacts must be used to specify technological solutions, since information technology "codifies" and "conveys" norms and common interpretations (Monteiro and Hanseth, 1996, Giddens, 1984, Rose and Scheepers, 2001). Furthermore, ANT's concept of black box supported our acceptance of these mediating artifacts as black boxes, for instance a business model's norm. This perspective was introduced in our approach by disregarding the steps that led to their emergence, considering them as networks with a stable behavior.

A black box can be questioned, which may cause it to be opened and lead to the start of a new translation. Authors like Holmström and Stalder (2001), Law and Callon (1992), and Williams-Jones and Graham (2003) believe that it is in the cases where translations fail that the embedded norms and values are often best revealed. The obtained insights can lead to changes in the business model and on how their actors interact. On the contrary, if a translation succeeds, the network stabilizes and can be treated as a black box that, in the majority of the cases, must be successfully implemented in an information system.

ANT, Structuration Theory, and Social Capital provided us tenets to broaden our understanding of networked business models. Their individual contribution to BIZ2BIS is depicted in Table 7. The identified items compose a repertoire of network information that we used to support the development of the artifacts as well as the organization and outcomes of our approach.

Table 7: Contributions from ANT, Structuration Theory, and Social Capital to BIZ2BIS

Influences	Topics to address in the development of BIZ2BIS
Actor-Network Theory	Identify the network goals Define the network borders Describe the actors in their practice Detail actors' relationships Perceive actors' common purposes Understand how actors can be involved in the network Specify an outline of a negotiation mechanism Take into account human and non-human actors
Structuration Theory	Detail current practices Identify available resources Describe common codes, languages, norms and sanctions
Social Capital	Address each actor's interactions Depict common codes, languages, norms and sanctions Take into account the nature of the actors' relationships

3.8 Conclusion

Our review of the literature on business models (Chapter 2) strengthened the importance of accounting for the influence of the social context in which they are developed and implemented (Monteiro, 2000, Pateli and Giaglis, 2004, Hoegg et al., 2006). The importance of considering their social dimension becomes even more acute in network configurations in which several actors possess their individual interests that must be coordinated across the network. In the literature review, we noticed that most of the available proposals did not possess indications on how to address social factors. Moreover, a connection among those factors, the business model, and their underlying information systems was not established.

We sought inspiration in ANT to complement business model theories. Its insights influenced three major domains: collecting information on the network, developing negotiation mechanisms that promote the alignment of the network actors, and establishing a link between the socio-technical perspective of business models and the elicitation of the high-level requirements of their information systems. ANT's concepts were used as a tool to analyze the social and the technical all at once. It guided us into a world of associations, inspired us to follow the actors and describe them, improving the visibility over the interplay of interests, and thus enhancing the understanding of how heterogeneous networks are forged and molded to achieve stability. Its view of how ideas, values, purposes, and activities become inscribed in technology (Akrich, 1992, Akrich and Latour, 1992) and how this inscription perpetuates these aspects over time (Mähring et al., 2004) also offered us an innovative way of looking at the role of information systems in business models. It allowed us to explore synergies between these two domains.

Structuration Theory's and Social Capital's influences were also integrated in our research as a starting point from which to analyze networked business models. They address issues not covered by ANT and promoted a broader social analysis of the networked business models. Structuration Theory's concepts captured the essence of the structure in which they exist, which allowed a better understanding of how their context can influence behaviors, and therefore actors' interactions and activities. In turn, Social Capital reinforced the relevance of the guidelines obtained from Structuration Theory and drew our attention to the importance of sensitizing the nature of the network relationships. It offered insights to expose signs of cooperation or conflict that can support the understanding of the network dynamics, and thus assist in the search for network alignment.

The Structuration Theory and the Social Capital's ability to describe a context and its influences in human actions, together with ANT's aptitude to analyze in detail the relationships between the actors of a network provided a new background to analyze networked business models. We explored synergies between the intelligence gathered in this chapter and the one previously obtained on business models and adapted the achieved outcomes to the discussion, design, and evaluation of networked business models. Our approach provides insights to support sense-making, as well as the choices of the actor with power to decide. Answering Monteiro's and Hanseth's (1996) call to be more specific about technology, BIZ2BIS also translates the outcomes of the business model analysis to the specification of its supporting information systems. The next chapter presents the research strategy we used in our work.

Chapter 4

Research strategy

4.1 Introduction

In Chapter 2, we identified key topics to consider when analyzing, designing, and evaluating business models (e.g., value propositions, actors, or business flows) according to the reviewed literature. However, throughout that study we noticed that many of the existing proposals did not address business models in network configurations, and most of them did not encompass the richness of their context, nor explored the connections between business models and their technological support. Like Pateli and Giaglis (2004), we believe that the awareness of social influences may disclose valuable insights on how to develop a sustainable business model, particularly in network scenarios, which are usually characterized by highly complex relationships and dynamics. Furthermore, the way business models can shape their information systems led us to consider the advantages of translating the insights obtained through business model analysis (including its social perspective) into the high-level requirements of its information system, thus bridging an existing gap. Acknowledging the social character of the research and of the phenomenon under study, we sought for guidelines that could help us deal with this social dimension. Our main source of inspiration was ANT (Chapter 3). The insights obtained with these chapters led us to the formulation of the following research question:

RQ1. How can the discussion, design, and evaluation of business models in network configurations benefit from ANT's contributions?

The research progress clarified and detailed lines of study, providing the knowledge to refine RQ1 as presented below:

a. How to account for socio-technical aspects in business models?

b. How to identify the stakeholders and represent a networked business model so that it is clear to all involved?

c. How to create an approach capable of aligning the goals of the various stakeholders?

d. How can indications about the business model stability be provided to stakeholders?

e. How to consider the dynamic nature of inter-organizational business models?

The need to overcome the gap between business models and information systems domain also gave rise to the additional research question:

RQ2. How can business model requirements (including its social context) be translated to its underlying information system specification?

This chapter outlines the thesis research approach used to address these questions. Following this introduction, we open by justifying the adopted epistemology in section 4.2. We position our investigation according to existing research traditions in business model and information systems. Then, in section 4.3, we describe how we conducted it (methods used and techniques applied). For each case study that is presented, in section 4.4 we provide a small description of its context, as well as our reasons for choosing it. To complement the findings obtained with case studies we also employed action research, which allowed us to regard the practitioners' reaction towards the application of BIZ2BIS and its outcomes (section 4.5). Rigor and validity in action research, as well as generalization issues, are addressed respectively in sections 4.5.5 and 4.5.6.

At the end of the chapter, the reader should be able to:

1. Perceive the adopted research strategy;
2. Understand the reasons that supported the choices we made.

4.2 Underlying epistemology

Epistemology covers the relationships between the knower and the known, looks into what is knowledge, and the kind of knowledge that can be obtained (Guba and Lincoln, 1989). How we position ourselves in this question profoundly influences the way we uncover knowledge. Burrell and Morgan (1979) identified two extreme positions: positivist and anti-positivist.

A positivist research assumes an objective reality that exists out there, that can be observed and accurately measured using scientific methods in a non-biased way (Cecez-Kecmanovic, 2011). It considers that the reality observed is independent from the observer and that both do not influence each other (Figueiredo and Cunha, 2007). If some influences are detected (threats to validity) an attempt is made to reduce or eliminate them. It is explained by immutable laws (Ibid.), and knowledge is summarized as time and context-free generalizations, some of which take the form of cause-effect laws (Guba and Lincoln, 1994) that can be discovered by structured observation (Walsham, 1993). Positivists are likely to use existing theories to develop hypothesis that will be tested and confirmed, or refuted, in a cumulative process (Saunders et al., 2009). Negative evidence eliminates a hypothesis of a causal relation, whereas supporting evidence strengthens it. It is also important to note that values are not considered in the construction of knowledge in a positivist approach. They are seen as "confounding variables that cannot be allowed a role in a putatively objective inquiry" and that "ethical behavior is formally policed by external mechanisms" (Guba and Lincoln, 1994, p. 114).

By contrast, anti-positivists, reject the existence of regularities in social reality – they see knowledge as personal, subjective, and unique (Cohen et al., 2011). Within the anti-positivist camp, interpretive studies consider that realities are not given as “hard facts” (Scherer, 2003). Interpretive belief rejects the possibility that every observed action has a cause and that every cause has an effect. It also claims that there is no objective reality that can be discovered. There are no predefined dependent or independent variables. As an alternative, there is a focus on the complexity of human sense-making, as a situation emerges (Kaplan and Maxwell, 1994). Over time, it is possible to formulate more complete interpretations that increase the awareness of the research.

Interpretive researchers follow the assumption that any observed action must be understood in the social context in which it is constructed and interpreted by individuals through interactions with the world around them (Figueiredo and Cunha, 2007). This entails the need to get “inside” the examined phenomenon, which inevitably makes it very difficult for the researcher to be totally objective. They argue that organizations, relationships among people, and technologies are not static, because, as Permenides observed, “you cannot swim in the same river twice”. In this immersion, values have an important role to play in the knowledge construction, since the role of the researcher as orchestrator and facilitator demands a conduct able to promote cooperation and trustworthiness (Guba and Lincoln, 1994). Since hiding intents can be destructive to the aim of uncovering and improving constructions, this stance includes the participant values in inquiry (Guba and Lincoln, 1994).

We acknowledge that the embracing of a particular paradigm has an impact on how research is conducted - “different ways of viewing the world shape different ways of researching the world” (Crotty, 1998, p. 66). In order to define the theoretical drive of our research, we contend that an interpretive approach is the most suitable option to take into account the exploratory nature of our research questions. It enables us to get “inside” the situation for which a team is devising a business model and regard the different interpretations and meanings that people ascribe to decisions and activities (e.g., assuming divergent positions and establishing an alliance). It allows us to emphasize the importance of understanding the complexity and richness of business model contexts (e.g., political and cultural constraints), rather than explaining it through cause-effect relationships. It is naive to think that a decision maker can control all the variables that affect a system as complex as a networked business model.

Interpretive research also provides an understanding of how information systems are used in a particular business model, the dependencies between both, and how they influence, and are influenced, by their context (Walsham, 1993, p. 4-5). In fact, as pointed out by Walsham (2006), this paradigm has emerged in recent years as an important strand in the information systems domain, widely embraced within this literature field (Boland, 1991, Myers and Klein, 2011). Given that there is little interdisciplinary research on exploring the links between business models and their supporting information systems, we aspire to establish a context-specific connection between both domains. With BIZ2BIS, we intend to reach an in-depth understanding of the business model interests, relationships, dynamics, goals, beliefs, experiences, feelings and values, in order to translate their restrictions to the specification of high-level requirements of its information system.

Klein and Myers (1999) proposed a set of principles for conducting, reporting, and evaluating interpretive studies, derived from anthropology, phenomenology, and hermeneutics. These authors agree that interpretive research does not subscribe to the idea that a pre-determined set of principles can be applied in a rigid way. However, they consider that the absence of any criteria increases the risk that interpretive research will continue to be judged inappropriately. For this reason, they believe that the explicit articulation of the principles will contribute to the improvement of interpretive field research.

The set of defined principles are: 1 - Hermeutic circle, achieves understanding by iterating between considering the interdependent meaning of parts and the whole that they form; 2 - Contextualization, regards the social and historical background of the research setting; 3 - Interaction between researchers and subjects, considers how the research materials or “data” are socially constructed through interaction; 4 - Abstraction and generalization, relates idiographic details revealed by the application of principles 1 and 2 to theoretical, general concepts that describe the nature of human understanding and social action; 5 - Dialogical reasoning, searches for possible contradictions between the theoretical preconceptions guiding the research and actual findings; 6 - Multiple interpretations, tries to detect possible differences in interpretations among the participants; 7 – Suspicion, looks for possible “biases” and systematic “distortions” in the narratives collected from the participants.

We applied the mentioned principles in our research, but not in a mechanistic way. We assessed our scenario of study and judged the principles that best fitted our specific case. As claimed in (Klein and Myers, 1999, p. 88), “We do not have absolved authors, reviewers, and editors of the effort of working out whether, how, and which of the principles should be applied in any given research project”.

We used the research “onion” (Saunders et al., 2009), presented in Figure 21, to guide our research and point out available options. We have already addressed the outer layer (blue background). In the following sections, we will discuss the remaining layers (white background) having as a starting point the strategies of enquiry.

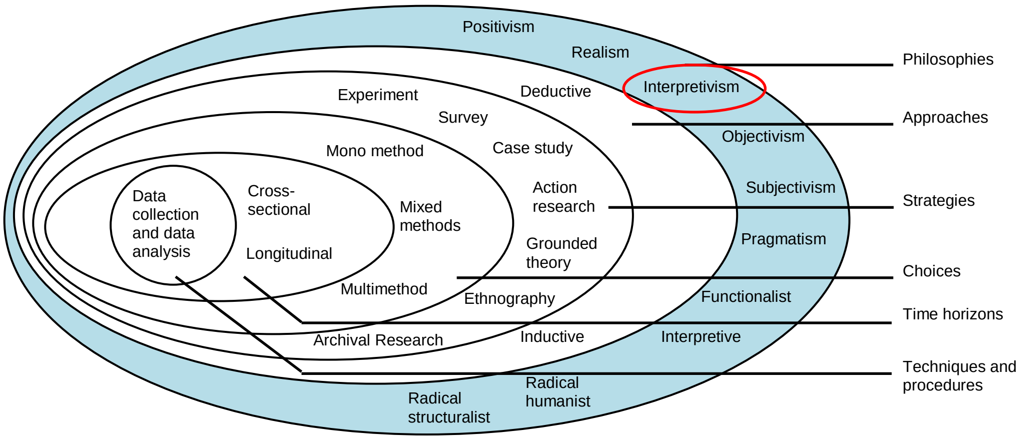


Figure 21: The research "onion"

Source: Adapted from Saunders et al. (2009)

4.3 Research methods

A research method is "a strategy of enquiry which moves from the underlying philosophical assumptions to research design and data collection" (Myers, 1997, p. 5). Leech and Onwuegbuzie (2009), and Mingers (2001a) advocate that the diversity of research methods and paradigms provides a wider range of knowledge traditions to support research. By combining several methods, investigators are able to focus on different aspects of reality (e.g., different needs, situations, and perspectives) and therefore provide a richer understanding of a research topic (Esteves and Pastor, 2004). They are able to visualize a more complete picture of human behavior and experience, which puts them in a better position to strengthen their understanding and achieve their goals more promptly.

Denzin (2008), Trifonas (2009), and Creswell (2009) also underline the benefits of integrating different approaches, distinct ways of viewing a problem, and diverse types of data in conducting both confirmatory and exploratory research, induction and deduction, and in answering research questions. According to Morse (2003) and Denscombe (2008), there are additional advantages in adopting more than one research method: (i) triangulation - validation of data and results by combining methods, data sources, or observers, thereby overcoming the weakness of single approaches ; (ii) creativity - discovery of innovative or contradictory factors that provide a more complete picture of the phenomenon under study and motivate future work; (iii) expansion - widening of the scope of the study to take in contextual aspects of the research situation.

The use of various research methods can adopt different designs (Morse, 2003, p. 190):

1. Mixed methods – incorporation of various qualitative or quantitative strategies within a single project, which may have either a qualitative or quantitative theoretical drive. The "imported" strategies are supplemental and are used to clarify or provide clues that are used within the core method. The ideas from the supplemental data inform the main research method and are verified within the main focus of the project.

2. Multimethod – utilization of two or more research methods, each conducted rigorously and complete in itself, in one project. It is used in a research program when a series of studies are interrelated within a broad topic.

We followed Robey's (1996, p. 406) belief that "theoretical foundations for research and specific research methods are justified by research aims, or purposes". In view of our research questions, we adopted one of Morse's possible configurations (Morse, 2003): the sequential combination of two qualitative methods: case study and action research. In our research program we chose four linked projects, yet self-contained, that fit under the rubric of network business models and their underlying information systems. The goals of each project were triangulated to inform the research inquiry. Given our research questions, we worked in "discovery mode" (Ibid., p.196). This does not mean that in specific situations we will not be testing ideas, hunches, or hypothesis. It just means "that in the greater scheme of things, the agenda is one of discovery" (Ibid., p.196).

In the following two sections we will present case study and action research. Their contribution to this research will be explained.

4.4 Case study

In this section, we define the concept of case study, present some of its history, and discuss the arguments that led us to choose this research method. The performed case studies will be introduced.

4.4.1 Case study definition and history

Yin (1994, p. 13) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used". This author also highlights that case study facilitates an in-depth analysis, as well as the retention of an holistic perspective that promotes the understanding of the research context and of the processes being enacted (Morris and Wood, 1991, Yin, 2003).

This form of research has been used by academics for at least a century and is marked by periods of height and others of decline. According to Johansson (2003), case studies appeared around the 1900s, initially within the discipline of anthropology. The earliest use of this research form can be related to narrative descriptions of journeys and studies of cultures that used participant observation as the main method of data collection. Historically, the origin of the case study concept also received contributions from medicine, social work, and psychology, where it was often called “case work” or “case history” (Platt, 1992, Johansson, 2003).

In the United States, case studies were most closely associated with The University of Chicago, Department of Sociology (David, 2007). This school applied the case study strategy on contemporary society. It studied and reported immigration to the United States in the beginning of the 20th century, covering aspects like poverty, and unemployment (Hamel et al., 1993). At that time, a distinguishing feature of the case study was the access to personal meanings (Platt, 1992).

During the period leading up to 1935, there was a movement within sociology to make it more scientific. In this prewar period “case study methods” were usually contrasted with “statistical methods” (Platt, 1992), underlying a qualitative versus quantitative distinction. The impact of the Second World War on society also reinforced the preference towards positivism and quantitative methods. Around the 1960s, the controversy created around the limitations of quantitative methods and the development of Grounded Theory by Glaser and Strauss (1967) gave a new breath to case study research (Afonso, 2009). Another landmark to the field was the contribution of Robert Yin (1984, 1994). The author “transferred experimental logic into the field of naturalistic inquiry and combined it with qualitative methods” (Johansson, 2003, p. 7).

The case study has been widely accepted and legitimized in the business model and information system fields. In the former, it has been used since its inception up to now. Examples are the work developed by Chesbrough and Rosenbloom (2002), Gordjin (2002), Osterwalder (2004), Vuorela (2005), and Horsti (2007). Similarly, in the information systems field it has been applied since the 70s (Orlikowski and Baroudi, 1991, Doolin, 1996, Markus and Lee, 1999). This tendency has been shown in the literature, for instance Farhoomand (1992) and Mingers (2001b). More recent case studies confirm its current relevance and its contribution to the information systems domain, such as: implementation of Inter-Organizational Information Systems (Rodon, 2007), and software development processes and practices (Runeson and Höst, 2009).

4.4.2 Why choose case study?

According to (Yin, 2009, p. 2), case study is the preferred method when (a) “how” and “why” questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context. These considerations are in tune with our research. Based on a thorough literature review, we identified the need to understand how the discussion, design, and evaluation of business models in network configurations could benefit from ANT’s contributions. In these scenarios of study, we do not have control over the events as they unfold. Item (c) also corresponds with our research. The investigated situations confront a contemporary phenomenon: networked business models and their underlying information systems, within their real-life contexts. The case study’s features reveal themselves particularly suited to real situations in which it is difficult to separate a phenomenon’s variables from its context (Yin, 1994).

In the light of the described specifications, the case study is an effective way to learn about business networks and to see how certain theories can be put into practice. It allows their study within their context to comprehend the dynamics involved in setting and developing a holistic description of the network (Halinen and Törnroos, 2005) in which contextual conditions gain a critical relevance. After all, business models can be deeply influenced by aspects as diverse as: complex and dynamic interrelationships, shared or conflicting interests among the actors involved, structural aspects, political restrictions, social quarrels, and cultural issues – characteristics that to be genuinely understood must be investigated in real world settings. In our investigation, case study research helped us perceive how BIZ2BIS could be used in a real case.

Our research also addresses information systems supporting business models. Like Davidson (2002), Lee and Xia (2005), and Holmström and Robey (2005), we believe that information systems development is a socio-technical process. Therefore, it is vital to perceive its surrounding context and use the gathered data to support its specification and development. The features that made the case study particularly suited for researching business models are also relevant for the information systems field. It produces "an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham, 1993, p. 14).

Case study research provides a "thick description" of social interactions and practices (Yin, 1994), which gives researchers access to the subtleties of change and multiple interpretations (Walsham, 1995a). These thorough descriptions enable the capture of reality in natural settings and in sufficient detail to react or adapt to the complex and dynamic characteristics of real world phenomena (Runeson and Höst, 2009). In our research, it aided us to translate the outcomes obtained with the business model study to the high-level requirements of its information system. In addition, the case study's ability to address these fields also supported our aim to enhance our approach (detecting incoherencies and tuning it).

Business networks pose various challenges when conducting case studies or other research methods. Halinen and Tornroos (2005) distinguish the following: 1 - Setting the network boundaries, as the interdependency among actors makes network boundaries arbitrary; 2 - Handling the complexity formed by the network structure and "embeddedness" (connotes an actor's position in a network, relationships, and dependencies on spatial, political, social, technological, and market structures); 3 - Dealing with the time dimension, as networks are dynamic and susceptible to change by their very nature, and 4 - Comparing cases, as each case is unique, as a result of context specificity and historical background. Although we did not solve all these issues, we discuss solutions to approach them in designing and executing the cases, present our contributions, and point out their limitations.

Yin (1993) states that three types of case studies are to be distinguished: exploratory, descriptive, and explanatory. In exploratory case studies, the researcher starts with a preliminary notion of the object of study and its context. During the research project these notions gradually obtain precision. They are usually used to investigate a not so well known phenomenon or one without an established theoretical basis (McLeod et al., 2011), as a pilot to other studies or research questions. Often, they are also used as an initial exploration to obtain new insights for future research (Easterbrook et al., 2008, Runeson and Höst, 2009). Descriptive case studies focus on phenomena worth portraying and documenting (Yin, 2003), providing narrative accounts. They require a theory to guide the collection of data and "this theory should be openly stated in advance and be the subject to review and debate" (Yin, 1993, p. 22). Often researchers wish to go beyond description. This can be done in explanatory cases, where researchers look for cause-effect relationships and for explanations of a particular phenomenon. Yin (2009) cautions researchers that the boundaries between these categories (or the occasions when each is to be used) are not always sharp.

4.4.3 Research design

The design is the logical sequence that connects the data to the research questions and, ultimately, to its conclusions (Yin, 2009). It consists in "a logical plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions" (Yin, 2009, p. 26). Following (Yin, 2009), we address the case study protocol by discussing the case study questions, the selection of its unit(s) of analysis, field procedures (i.e., general sources of information and procedures to collect that information), and the criteria used for interpreting the findings.

4.4.3.1 Case study questions

The conducted literature review helped us to generate the theoretical underpinnings on what is to be studied and provided indications on new investigation topics. We started by focusing our attention on the business model field (including business networks) and perceived that, in spite of the importance assigned to the use of social theories in this domain, there were no indications on how to address it. We also became aware that the assessment of the business models was usually confined to financial aspects. It neglected other relevant elements that could also have an important role to play, such as information flows (e.g., data inserted in a database) and intangible flows (e.g., brand influence or actors' prestige). Furthermore, a connection between the business model and its supporting information system had not been established, namely between the impact of business model restrictions and social factors in the information system specification and development. Taking into account the socio-technical nature of networked business models, we decided to explore this feature using ANT. This choice was based on its ability to reveal network spaces, their human and non-human actors, existing relationships, and the network complex dynamics. ANT declares that the world is full of hybrid entities, and opens the "black box" to perceive, in our case, how information systems influence – and are influenced – by business network contexts. This puzzle-solving process, in which "we come to understanding piece by piece, one step at a time" (Morse, 2003, p. 189), assisted us in the formulation of the research questions RQ1 and RQ2. We based our study in some premises obtained in relevant literature:

- A business model is an abstract representation of an organization (or network of organizations) that expresses the business logic. It describes the involved actors, their roles, exchanged flows, and how value is created and shared among the actors that intend to create customer and network value in order to achieve their goals.

- Companies are experiencing the need to create interoperable networks across enterprise boundaries for reasons of cost, efficiency, and innovation.
- Networked business models are characterized as decentralized environments, usually without a single point of authority for decision making, where companies depend on a collective project with shared meanings, rules, and interests that in some cases have a difficult coexistence due to individual expectations.
- The complexity of the networked configuration highlights the business model socio-technical nature.
- ANT, through its concepts of translation and inscription, contributes to disclose actors' relationships and network complex dynamics.
- Information systems should not be regarded solely as technical artifacts, but as social systems enabled by technology.

Therefore, we resorted to ANT's "lens of investigation" to explore the socio-technical nature of networked business models, their dynamics and the interactions among their actors. Our aim was to discuss, design, and evaluate business models in network configurations, which will equally contribute to disclose its underlying information system's high-level requirements. In addition, we wanted to perceive if the actors' level of satisfaction with their participation was enough to keep them present. This evaluation enabled us to propose alternatives that could mitigate existing problems, thus strengthening the business model viability. To do so, we started by identifying the connection points between business model theory and ANT to create a combination of contributions able to describe the key phenomena in each case. While doing so, feedback loops enabled us to refine our proposal, as well as our research sub-questions with aspects pointed out during the cases. RQ2 was less explored due to the characteristics of the cases.

4.4.3.2 Unit of analysis

The selection of the proper unit of analysis is critical in any case study. In this thesis, since we are interested in perceiving the suitability of BIZ2BIS to discuss, design, and evaluate real-world networked business models, we used them as our unit of analysis. We resorted to the following set of necessary, non-sufficient, criteria to choose the case studies. Firstly, the business model value propositions should be offered by a network of at least three actors. Secondly, the business model should involve an information system. Thirdly, at least one of the participating actors should be interested in evaluating the networked business model (current or future, or both). Fourthly, the case should be accessible, allowing interviews with (a) key informant(s).

Three case studies were conducted in order to examine the social and organizational dynamics of business analysis and evaluation in situ. The first one addressed the business model employed in HowMuchIsIt (fictional name for confidentiality reasons) - a portal-supported mediation service for the acquisition of technological equipment. The case was focused on perceiving the viability of the portal business model, since it was facing financial problems and its shareholders needed guidelines for future decisions. The second one involved the development of a Scientific Journal Portal and the assessment of sound business models for the submission, review, and publication of articles. It enabled us to understand the outputs that a business model analysis could bring to its information systems development and whether, or not, our approach could be used as a strong communication tool among the business analysts and the information system deployment team. The third case, the GreenHomes project, intended to improve environmental efficiency in an ecological community supported by a platform. It aimed at recording electricity consumption to monitor its user patterns and adjusting energy usage to prices or available suppliers. This case study had a strong emphasis on negotiation mechanisms that could detect the interests of the actors in order to maintain their presence in the business network. Given that the portal had not yet been developed, it was possible to see if our approach was able to contribute with insights from the business model study to refine the high-level requirements of the information system underlying the business model. Furthermore, it allowed us to perceive how people unfamiliar with the approach were able to apply it (resorting to examples from previous cases and to short descriptions of its use).

The three cases covered common aspects of the sub research questions (see Table 8). All were focused on how ANT's concepts could be properly applied to the study of networked business models and to its description, creating a common background of knowledge clear to all the involved actors. They also acquired a formative role. Since they were sequentially performed, they assisted us to gradually confirm and reveal relevant lines of research. In the three cases, we repeatedly confirmed that ANT aided the analysis of business models. HowMuchIsIt and the Online Journal enabled us to perceive the need to use ANT in a subtle and imperceptible form and the importance of providing negotiation mechanisms to support network alignment. GreenHomes, in turn, revealed the need to make de approach more flexible to account for the business model dynamics.

Table 8: Research questions covered by the case studies

	ANT in the study of business models	**Description of the network**	**Negotiation mechanisms**	**Evaluation of the business model**	**Business model dynamics**	**Outputs to the IS field**
HowMuchIsIt	✓	✓		✓		
Journal	✓	✓	✓			✓
GreenHomes	✓	✓	✓	✓	✓	

As business networks are embedded in social, political, and historical contexts that make them unique in some way (Halinen and Törnroos, 2005), the contributions of each case can vary significantly, and comparing them can be a difficult task. To some extent, we were aware of problems that could compromise the cases. Nevertheless, everyday reality can always surprise us and change our preconceptions. Although it has not been possible to explore the cases as expected, we used the unexpected as an alternative look that helped us to take a step forward towards the enlightenment of our research questions. Our cases took place sequentially and, whenever a discovery occurred, the disclosed development was translated and integrated in the case study that followed.

4.4.3.3 Data sources, collection, and analysis

To detail a networked business model, it is necessary to obtain information about its actors, their interests, their interactions and activities. In our approach, this search for information was inspired in ANT’s proposal of following the actors. In this ongoing quest to improve the knowledge about the network, it is fundamental to disclose intangible aspects of its relationships (e.g., cooperation, competition, incompatibility), as well the actors’ own perceptions about the network. Since these topics are not usually found in written sources, whenever it was possible we used interviews with key players as our main source of information.

Interviews are recognized to be the source of information that provides researchers the “best access [to] the interpretations that participants have regarding the actions and events which have or are taking place” (Walsham, 1995b, p. 78). They enable the participants to present their interpretation of the networked business model in which they are involved and to express their point of view. As noted by Tuckman (1972), an interview, by providing access to what is “inside a person’s head”, reveals what a person knows (knowledge and information), what a person likes or dislikes (values and preferences), and what a person thinks (attitudes and beliefs). Interviews were vital to understand the business model. Their topics addressed the network characterization and the involved actors, gathering the required background to discover what could incite adherence to the business model and maintain the participation in the network, thus providing feedback about the choices made throughout the cases.

The conducted interviews were semi-structured. The job positions of the interviewees usually included CEOs, CIOs, project managers, and clients (all were chosen for their relevance to the business model under study). Interviews with experts on the business model topic were also advantageous due to their capacity to reveal and share restricted knowledge. The respondents were selected on the basis of their involvement and knowledge about their business model. ANT’s recommendation to regard non-human and human actors as identical, led us to assemble non-human perspectives by asking the human to express their views about them and by collecting documentation that could clarify their role in the network.

The interviews usually lasted from 1 to 2 hours and were previously adapted to the domains of the respondents, who were invited to present their insights and opinions on occurrences they felt relevant. In the interviews, follow-up questions were asked to clarify previous answers. All the interviews were conducted in Portuguese and were immediately transcribed and analyzed. The resulting outcomes were used as inputs for clarification in subsequent interviews. The gathered data was collected and analyzed in an iterative way (Strauss and Corbin, 1998), which enabled us to gain a deep understanding of different viewpoints, connections, and contradictions within, and across, interviews. Furthermore, it allowed us to perceive if BIZ2BIS was able to capture the actors' feedback and provide an outcome according to their expectations.

The way the data were approached in this research is in line with ANT's key ideas – avoid simplification, enter into a social setting, follow the actors, understand the dynamics of their everyday activities, and consider their practice, as well as their social and material environment. As suggested in the literature (Yin, 2009, p. 114), we relied on multiple sources of evidence to promote the access to multiple perspectives of the cases under investigation. This diversity increased the understanding of the different viewpoints and exposed business model relationships, as well as the network complex contextual factors. It also helped to detect contradictions in the positions observed.

The interviews were complemented with available documentation: internal documents of the organizations participating in the network, established protocols, Internet web pages, reports, or press articles. This data "triangulation" (Yin, 2009) created converging lines of inquiry that increased the data depth, as well as internal reliability. The cross-checking mechanisms for the data have evolved throughout the cases, i.e., the aspects to analyze and the mechanisms to do it were continuously refined. For each case, we created a database that enables other researchers to review the collected information and develop their own conclusions (found on the CD enclosed). We provided supplementary documents in digital format in order to prevent that the core part of the thesis become unnecessarily longer than it already is.

The process of analyzing data in this research was partly inspired by coding strategies. The literature pointed out topics to take into account when approaching business networks and their business models. For example: their actors, relationships, expected interests, value propositions, performed activities, used resources, business flows, norms, or sanctions. Subsequently, we followed the trends that emerged in the course of the research. Based on this theoretical background, we divided data into categories. A repeated reading of the transcripts enabled us to detect recurrent topics, behaviors, concerns, and practices, which were used as guidelines to refine the information to obtain in subsequent interviews and the use of the approach. As the research progressed, its interest was not so focused on issues of network representation. It evolved to address negotiation mechanisms and viability issues, keeping in mind the need to transpose the business model requirements to the specification of its information system. In the case studies, the need to respond to unforeseen circumstances provided clues to enhance our approach to discuss, design, and evaluate business models.

In this multiple case study design, each case was analyzed in its own right. In Chapter 6, where we summarize the roadmap to the BIZ2BIS proposal, we will detail their contributions to the performed research. For each one, we will describe its context, justify the reasons for its study, point out potential limitations, and discuss improvements to the proposal.

4.4.4 Reliability and validity in a case study

The validity of interpretive case studies is determined by the reader, based on the evidence supplied by the study. Case studies do not possess the tools that other forms of research enjoy when judging its quality. Nevertheless, they should abide by canons of validity (Cohen et al., 2011). We have applied the following (Yin, 2009):

- Construct validity – we have employed accepted definitions, used multiple sources and forms of confirmation to address research questions (e.g., triangulation of data), and established a chain of evidence, such that every step of each case study could be tracked. Whenever it was possible, key informants reviewed draft case study reports.
- External validity – we have clarified the context, theory and domain to which the contributions of our case studies could be helpful.
- Reliability – we have used a case study protocol to deal with the documentation and developed a case study database. Together, these tactics enabled other researchers to follow our steps and reach the same findings and conclusions.

The three case studies we briefly mentioned helped us refine our data collection plans with respect to both the content of data and the procedures to be followed when applying the approach. In spite of the valuable outcomes, we could not apply all the features of the approach and our sub research questions were not completely addressed. For instance, we did not have yet the chance to incrementally disclose the business model's boundaries by following the actors in a complex network. Nor did we use the updated negotiation mechanisms developed to achieve the network alignment in collaboration with practitioners. Also they have never employed the artifact conceived to evaluate business model's value propositions to assess their participation. Furthermore, the specification of the high-level requirements of the underlying information system (based on our translation of the business model analysis' outcomes) has never been used as the main source of information to guide the work of a development team.

To advance our research, we have decided to go into the world of practitioners and use the framework that resulted from the case studies in an action research study. The outcomes enhanced our approach with a level of maturity that gave us reasonable assurance about its ability to address and meet the requirements of a rather complex real case, as well as contribute to its business model enhancement. Therefore, using the criteria established for case studies selection, we have looked for a complex networked business model in which we could establish a narrow collaboration with participating organizations. It was crucial for us to understand if the feedback of our analysis and evaluation was fundamental to solve their problems. We wanted to have some assurances that they were receptive to introducing changes in their environment according to the insights obtained with our approach. Moreover, it was important for us to confirm their availability to reflect on the practical implications of those changes. The InovWine project, which aimed at exploring the use of technologies to support activities of wine production, offered us favorable conditions that led us to adopt it as our next scenario. We have decided to choose it for two main reasons. First, it satisfied the requirements discussed above. Second, the complexity of its social dimension and the idealized technological solution enabled us to analyze how BIZ2BIS considered socio-technical issues when specifying the high-level requirements of supporting information systems.

4.5 Action research

Action research "aims for an understanding of a complex human process" (Baskerville, 1999). Since it does not resort to a representation of the world, but to the world itself, action research facilitates detailed inquiry into those processes and promotes the acquisition of insights into social phenomena. This provides the means to enhance the knowledge about socio-organizational influence, which can provide rewarding insights for both, business model and information systems field.

In spite of its promising features, action research is not without its flaws. Those who dispute some of the assumptions embodied in action research argue that there is a lack of impartiality from the researcher (Francis, 1991), that it is context-bound and not context free, which makes it difficult to establish causal relationships (Eden and Huxham, 1996), that it is little more than consultancy (Avison, 1993), that it lacks methodological rigor (Cohen and Manion, 1980, Davison et al., 2004), and that it has the tendency to produce either "research with little action or action with little research" (Dickens and Watkins, 1999, p. 131). We are sensitive to these arguments. However, we think that the first two should not be seen as a problem but as a philosophical option, as already explained in section 4.2. We will discuss the remaining two arguments in detail, after defining action research in section 4.5.1, presenting its historical background in section 4.5.2, and justifying its use in section 4.5.3, when describing action research in section 4.5.4. In sections 4.5.5 and 4.5.6, we discuss its rigor and generalization.

4.5.1 Action research definition

Action research presents distinctive features. As denoted by its name, it has the ability to combine theory and practice (and researchers and practitioners). This capacity is pointed out by (Rapoport, 1970, p. 499), who states that action research "aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework". This description highlights the idea that action research branches out in two distinctive paths. On the one hand, it intends to aid in solving real problems. On the other hand, it contributes to expand scientific knowledge. Later work continues to acknowledge this. For instance, Kock and Lau (2001) and McKay and Marshall (2007) follow the preceding assumption and introduce the idea that action research has "two masters" that must be served: the research client and the research community.

In action research there is an active and deliberate self-involvement of the researchers in the context of their work (McKay and Marshall, 2001). There is the belief that the study scenario can be more deeply understood if the researcher is part of the system being studied, and not an impartial spectator (Kock et al., 1997). As the researcher tries to comprehend what is observed, his/her personal values, ideologies, and a priori knowledge will invariably intrude into observations and resulting findings (Baskerville, 1999). However, this involvement of the researcher promotes the understanding between the “research-subject” and the “other subjects”, bridging the gap between scholars and practitioners. It stimulates collaboration between the researcher and the remaining actors of the problem context, facilitating and supporting the introduction of change.

Given the particularities of the problem context in action research, the collaboration between researchers and “problem owners” is fundamental in order to achieve a fruitful outcome for all participants. Both depend on each other. The researchers bring knowledge to the research context and have the chance to try out their theories with practitioners in real situations and real organizations (Avison et al., 1999). The “problem owners” provide access to real situations along with expert knowledge, thus contributing to solve their practical problem. As (Avison et al., 2001, p. 44) puts it: “No other research approach has the power to add to the body of knowledge and deal with the practical concerns of people in such a positive manner”.

What differs in action research when compared to other research approaches is the fact that it follows a different angle, in which the researchers are focused on creating change. They work from within a conceptual framework. The actions implemented to improve a problem should form part of and stem from strategies to develop, test, and tune theories that address the context under study (Avison, 1993, Baskerville and Wood-Harper, 1996, Checkland, 1991, McKay and Marshall, 2001).

Action research is used in real situations, rather than in manufactured, experimental studies. In these scenarios, it is extremely difficult to determine the cause of a particular effect, which owes its existence to factors as diverse as the cultural influences, political interests, the research itself or the theoretical principles used (Baskerville, 1999). Because the research is context-bound and not context-free (Baskerville and Wood-Harper, 1996, Blichfeldt and Andersen, 2006), researchers need to comprehend the ill-structured, fuzzy world of complex organizations, where the social component plays an important role (Avison et al., 1999). The action research supporters sustain that these situations can be better understood by inducing changes into their processes and observing the effects of those changes (Baskerville, 1999). For this reason, the knowledge obtained through action research is associated with a specific context, since each situation is unique, cannot be repeated, and cannot be dissociated from the situational and historical context in which it acquires meaning (Hult and Lennung, 1980).

Taken into account the features we just described, Hult and Lennung (1980) refined Rapoport’s definition of action research. These authors state that: “Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhances the competences of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical Framework” (ibid., p.247).

4.5.2 Action research historical background

Action research has its origins in the social sciences and it possesses two independent "roots" (Baskerville, 1999). One is the action-based social psychology of Kurt Lewin, who developed a field theory version of action research at the Research Centre for Group Dynamics (University of Michigan). Lewin's work (1951) intended to change the life chances of disadvantages groups (Cohen et al., 2011). Independently, the Tavistock Clinic (later the Tavistock Institute) built up a social psychology application of action research to study psychological and social disorders among war veterans, (e.g., (Trist, 1976)). These disorders were caused by World War II's side effects, such as battlefields, displacements, or prison camps. The two schools converged when Lewin joined the Tavistock Institute and inspired a vast stream of work in action research.

Before the conflict, scientists were not aware of how to treat war psychological syndromes. They acknowledged that each case had its particularities and, to enhance their knowledge on the complex cause of diverse "social illness", proposed the idea of social action. This proposal demanded the intervention of scientists in each of the experimental cases by changing some aspects in the patient's environment (Baskerville and Myers, 2004). As an outcome, a body of knowledge on successful therapy indications was obtained. In spite of the achievements, due to a reduction of public research funding and the natural resolution of social problems in the post-war era, the priority assigned to social psychology was cut down (Shah et al., 2007). At that time, the researchers tended to seek projects that relied on "hard" quantitative data and were supported by computer analysis – embracing the United Kingdom's vision of science (Clark, 1972). This configuration caused a decline in qualitative research and, as a result, "action research methods were seldom applied, and [were] often of marginal scientific quality" (Baskerville, 1999).

The second stage in the historical evolution of action research is associated with the "resurgence" or "revival" of interest in the United Kingdom, in the early 1970s (Carr, 2006). At the time, an interpretive perspective was favored, and Lewin's action research cycle evolved from a method by which practitioners applied social scientific theories to their practice into another which enabled practitioners to evaluate the practical adequacy of their own tacit theories "in action" (Elliott, 1987, 1991, Carr, 2006). This research strategy's scope has covered fields as diverse as: cultural aspects of a factory in England (Jaques, 1952), relationships between organizations and their environment (Miller and Rice, 1967), organizational restricting policies in the Norwegian shipping industry (Roggema and Smith, 1983), cost and job savings at Xerox (Pace and Argona, 1991), facilitation of quality circles in the United States and Japan (Cole, 1991), reorganization of the United States Naval construction Forces (Simon, 2000), and development of inter-organizational information systems (Figueiredo, 2004).

4.5.3 Why choose action research?

Nowadays, business models are characterized by complex environments and innovative, technology supported, configurations, where several actors with distinct and sometimes conflicting interests coexist, usually without a single point of authority. In scenarios with these characteristics, the capacity of action research to account for contextual influences makes it a powerful tool to aid decisions and to disclose vital interplays that can influence business models. The resulting knowledge can be used to ensure sustainable interests in the business models for all those involved and to offer additional guarantees of their suitability and viability.

Business model research is often justified in terms of its implications for practice. Action research also provides the means to improve the practical relevance of business models. It allows researchers to try out a theory in a complex real-life business model with the aim of solving practical problems. Its ability to work with practitioners and promote the collaboration between them and researchers enables the latter to learn from a real-life context, gaining feedback from the experience. This "partnership" enhances the reflection on the adopted solutions, as well as necessary adjustments, to achieve a satisfactory solution. Here, benefits for the practitioners and the research community are expected. It is a win-win situation for both.

Similarly to business models, information systems also have a strong relationship with their contexts and a highly applied nature. Their adoption can radically modify the way organizations use information and knowledge in a practical sense, causing profound changes in their procedures. However, through action research the academic community has the chance to regard the impact of its developments in real scenarios, facilitating the necessary changes and learning from them (Shah et al., 2007). Action research has the potential to solve practical problems while expanding information systems theoretical findings and enhancing their practical relevance.

The collaborative and action-oriented nature of action research is flexible enough to meet the emerging issues of technology-related change, when the research problem requires flexibility or modifications must be made rapidly or holistically. It enables inquiry into the identified problem, while offering valuable insights to researchers that intend to disclose the interplay among technical, economic, organizational, human, cultural, and political aspects of the intervention. It has the capacity to merge research and *praxis*, emphasizing the relevance of the real world and recognizing the importance of all the parts involved to obtain feedback that support the achievement of a better solution. As Avison (1993) puts it, action research is ideally suited to obtain understanding of whether technology or methodology is perceived useful and helpful in practice. There is also a focus on questions that may arise and how improvements can be put in practice within the value system of the problem owner.

Action research is particularly suited for information systems study (Baskerville and Wood-Harper, 1996). This viewpoint supported a renewing interest on action research, which coincided with the convergence between "social science" research and the emerging field of information systems development (Shah et al., 2007). For instance, Enid Mumford drew on her experience at the Tavistock Institute to develop an action research style of participatory design called ETHICS that covered the socio-technical nature of information systems development (Mumford and Weir, 1979, Mumford, 2001). Peter Checkland (1981), in turn, worked in developing the soft systems methodology, which is another landmark for the use of action research in the information systems domain. Wood-Harper is another important reference. This author explicitly presented action research to the information systems community as a research method (Wood-Harper, 1985). Like the previous two, he also integrated action research concepts into an action–based information systems development methodology – Multiview (Wood-Harper et al., 1985). These works all yield observable effects on practice (Avison et al., 1999). The support and interest around the use of action research in information systems remains. Clear evidence is the increasing number of contributions that have been published. In addition to single articles, for instance Baskerville and Wood-Harper (1996), Avison et al. (1999), Olesen and Myers (1999), Baskerville (1999), Simon (2000), Braa et al. (2004), Davison et al. (2004), Shah et al. (2007), and Peszynski et al. (2008), journal special issues like Baskerville and Myers (2004) and Kock and Lau (2001), and books like the one edited by Kock (2006) have been devoted to action research.

Based on the section arguments, we claim that action research is a significant way to improve our approach to discuss, design, and evaluate networked business models and to translate the resulting outcomes to the specification of its information systems' high-level requirements. Through its use, we aspire to solve practitioners' problems while expanding scientific knowledge.

4.5.4 Action research description

The capacity of intervention of action research assigns it a clinical nature that places researchers in a 'helping-role' within the organizations that are being studied (Baskerville and Wood-Harper, 1996). Most authors consider action research to be an iterative process involving its actors on a particular cycle of activities (Baskerville and Wood-Harper, 1996). This cyclic nature helps responsiveness and aids rigor (Dick, 2000). The outcome obtained in a cycle will be used to support decisions in the following cycle, enabling the test and refinement of interpretations previously achieved. This organization provides action research with the necessary flexibility to better deal with the complexity of social systems, since each new cycle permits an additional and enriched critical reflection.

Avison, Lau, Myers, and Nielsen (1999) and Dick (1992) propose a simplified representation of the action research cycle that clarifies its underlying philosophy (Figure 22): an intervention is planned for conducting further research (problem diagnosis); based on the previous analysis, a number of interventions are taken (action intervention) that will produce changes. A critical analysis of these changes is carried out (reflective learning), which makes it possible to identify adjustments that must be taken into account in subsequent cycles. Action research encourages the researchers to act and to reflect on the outcome of their intervention and the implication of their theories.

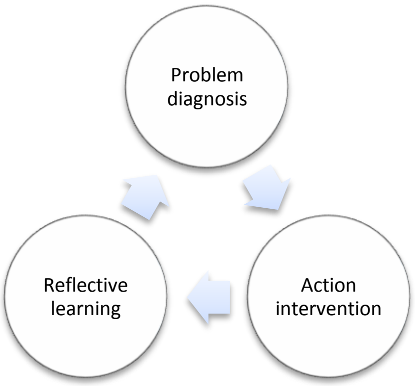


Figure 22: Simplified action research cycle

In spite of the consensus gathered around the above cycle, according to authors such as Baskerville and Wood-Harper (1996), Baskerville (1999), Simon (2000), and Shah et al. (2007), the most prevalent action research description is the long-established action research cycle presented by Susman and Evered (1978) (Figure 23). Previously to iterating its five phases, this proposal establishes a client-system infrastructure, which can be regarded as a separate phase that regulates the research environment.

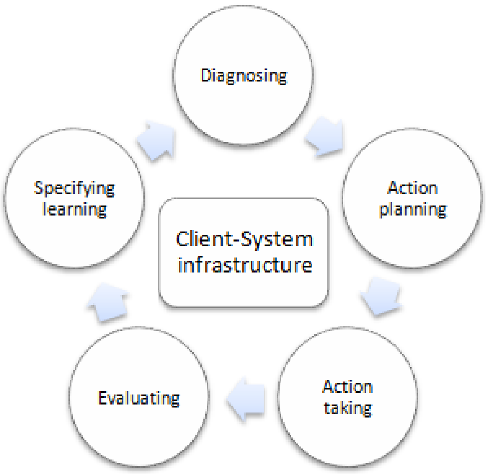


Figure 23: Action research cycle

Source: Adapted from Susman and Evered (1978).

Since action research is carried out in real-world circumstances, in some cases the researcher and the client organization can have different, and even conflicting, interests. For instance, the organization may intend to solve an additional problem (not specified initially) in order to improve its business performance, which is not of interest to the researcher. To avoid possible disagreements, researchers and practitioners need to share a mutually acceptable ethical framework that can clarify the interactions between researchers and host practitioners in terms of the research's goals, mutual responsibilities, required resources, authority aspects and sanctions available (Byrne, 2005). This idea is also supported by Checkland and Holwell (1998), who underline the importance of negotiating the researcher role in the context where the intervention is taking place. Baskerville and Wood-Harper (1996) also share this notion, since - in their opinion - the establishment of an ethical client-system infrastructure and research environment can contribute to achieve scientific rigor.

Baskerville and Wood-Harper (1996), Baskerville (1999), Winter (1996) provide a number of principles to consider in this endeavor. For example, make agreements in advance among all entities involved in the research to support intervention, consider how researchers' admission and departure must be managed, guarantee that the work developed must remain visible and open to suggestions, establish conditions for the dissemination of knowledge acquired during the research, or define confidentiality rules.

After establishing the client-system infrastructure, the five phases are iterated (Susman and Evered, 1978), as explained below:

1. Diagnosing - Analyzing the nature of the research domain to identify the complex problem that promotes the desire for change (some causes of the problem are pointed out). It involves its interpretation, not through reduction and simplification, but rather in a holistic fashion (Baskerville, 1999). This phase provides the foundations to develop the initial theoretical assumptions.
2. Action planning - Planning and selection of activities to address the problem. These activities, established among the researchers and the practitioners, intend to solve, or at least mitigate, the identified problems. The recognition of the planned actions is guided by the previously established theoretical framework.
3. Action taking - Executing the planned activities in the problem domain.
4. Evaluating – Assessing the results and reflecting on what has been achieved. This demands a critical analysis of the obtained results. In the case of a successful change, it is necessary to understand its reason. Otherwise, some adjustments for the next cycle should be defined.
5. Specifying learning – Reflecting explicitly on the activities and outcomes of the research projects.

The sequence presented above serves as an analytical tool, although each phase may not be consecutively conducted, nor is each step distinct (Byrne, 2005). For instance, the phase "specifying learning" is formally undertaken last. However, it is indeed an ongoing activity, where the beliefs are continually refined in the light of the outcomes. Furthermore, the end of an action research cycle may not imply that an end-point has been reached. New cycles can be initiated to build up additional knowledge concerning the researchers and the practitioners' activities, whether the action reveals itself to be successful or not.

There are many models describing action research. The usual representation of the action research process (as shown in the figures above) is a single cycle, with possible iterations. In turn, McKay and Marshall (2001) outlined a model that included two cycles that ran in tandem: one addressed client problem solving aims and the other dealt with the research interests.

In the problem solving cycle, action researchers must become aware of a real-world problem. They must develop endeavors to find out more about the nature of the problem and its context. After gathering the necessary knowledge, the researcher (in some cases in collaboration with other participants) plans a problem strategy and then proceeds to implement a number of action steps. These steps can be guided by a particular problem solving approach, which is monitored and evaluated. At this phase, if satisfactory results have been reached by the stakeholders, the process ends. Otherwise, the researcher amends the action plan and starts another cycle.

In the research interest driven cycle, the researcher has a particular objective or research questions to pursue. To enhance his/her knowledge, the researcher will explore the relevant literature to acquire the necessary background to plan and design the research project. Based on that, action is taken, monitored in terms of research interests, and evaluated to perceive the effect that the intervention has had in terms of research questions. If the researcher has achieved his/her expectation, the cycle ends. Alternatively, the researcher will change his/her plans and designs to search for other explanations.

It is important to mention that in reality, due to its inherent complexity, thinking and acting would rarely follow the neatness implied by the figures. Furthermore, the cycles are not conducted independently of one another, since points of connection and interaction can be established (McKay and Marshall, 2001, Cronholm and Goldkuhl, 2004, Peszynski et al., 2008) (Figure 24). It is McKay and Marshall's (2001) belief that this new conceptualization facilitates researchers to be much more explicit about the reflection and learning process inherent to action research. According to these authors, it allows for better planning, monitoring, and evaluation of the action research process, contributing to the improvement of action research's rigor.

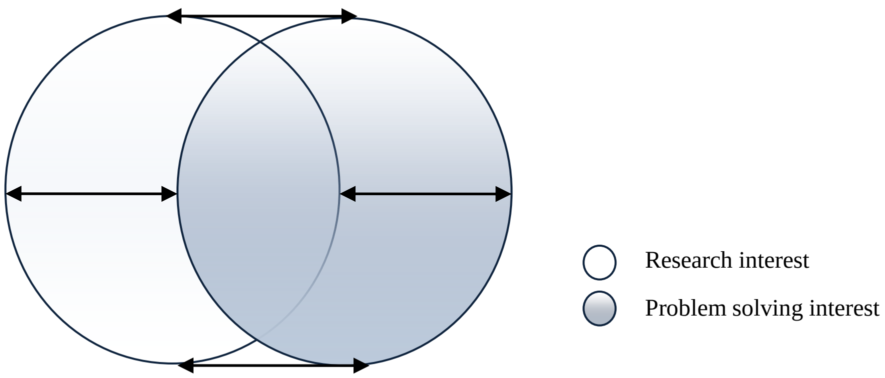


Figure 24: Action research dual cycle process

Source: Adapted from McKay and Marshall (2001).

The adoption of this dual cycle dismisses the criticism that action research is "consulting masquerading as research" (Coughlan and Coghlan, 2002, p. 237). This confusion is partly grounded on historical reasons, since both share a common background that can be traced back to Kurt Lewin’s work (Baskerville, 1999). However, they emerge as two separate streams that differ in important factors. According to Baskerville and Wood-Harper (1996) and Baskerville (1999), action research makes a commitment to the research community and to the practitioners, while in consulting the commitment is to the client (Shah et al., 2007). Their approach and motivation is also distinct. On the one hand, action research underlines the importance of establishing collaborations with the participants in the studied scenarios and supports its achievements on theoretical frameworks. On the other hand, consulting typically values its "outsider’s" unbiased viewpoint and the consultants are paid to suggest solutions that, according to their experience, proved to be reliable in similar circumstances. Finally, the consultation is usually linear – engage, analyze, action, disengage, while the action research process is cyclical.

The duration of an action research project can vary considerably. It depends on the characteristics of the problem being studied (e.g., its complexity, the type of relationship established with the client, or the number of cycles to perform).

4.5.5 Rigor and validity in action research

Based on the available literature, it is possible to detect an increasing emphasis on the call for greater rigor in the use of action research (Byrne, 2005). The absence of generally agreed evaluation criteria has been questioned regularly, which complicated action research acceptance and its credibility in some academic circles (Cohen and Manion, 1980, Lau, 1999, Baskerville, 1999, Avison et al., 2001). Avison, Lau, Myers, and Nielsen (1999) contend that there is a lack of detailed guidelines in terms of design, process, presentation, and criteria for evaluation.

To promote the rigor in action research, we searched for tactics in the literature to guarantee the quality of the evidence and therefore of the performed assertions. Using the five principles presented in (Davison et al., 2004), an extension of this work provided by (Vries, 2007), and contributions from other authors, we condensed our findings in Table 9.

Table 9: Principles to enhance action research rigor

Principle of the research-client agreement	
Mutual agreement	Establish a formal research agreement between researchers and practitioners on the suitability of action research for the organizational situation (Baskerville, 1999, Davison et al., 2004). It should contain mutual guarantees, support collaboration, mutual trust, and promote access to the organization (Lau, 1999). In addition, it should cover project's aims and evaluation measures (Davison et al., 2004)
Ethics	Researchers and practitioners need to share a mutually acceptable ethical framework (Avison et al., 1999)
Research focus	Specify the research focus intervention (Davison et al., 2004). It regards intelligence such as participating organizations, their extent of involvement, research participants' profiles, or the research timeline(Lau, 1999)
Roles and responsibilities	Stipulate the roles and responsibilities for all the involved (Lau, 1999, Davison et al., 2004)
Data collection methods	Identify the data gathered, as well as the methods used to collect and analyze it (Lau, 1999)
Principle of the cyclical process model	
Degree of openness	Justify changes to the traditional cycle stages (Lau, 1999, Davison et al., 2004, Vries, 2007)
Cycle description	Describe the stages of the action research cycle(s) (Lau 1998). In each cycle the research approach and the research questions should be critically analyzed. In the final stage of each cycle, a decision about the need of an additional one should be reached (Baskerville and Wood-Harper, 1996, Davison et al., 2004)
Principle of theory	
Research relevance	Perceive the importance of the domain of investigation (including the problem setting) to the interests of researchers and practitioners (Baskerville and Wood-Harper, 1996, Davison et al., 2004, Vries, 2007)
Theory	Report the theoretical framework role in diagnosing, guiding intervention, and evaluating the research outcomes, or, as the research progresses, in the emergence of theory (Baskerville and Wood-Harper, 1996, Davison et al., 2004, Blichfeldt and Andersen, 2006)
Principle of change through action	
Cause	Diagnose to obtain a clear understanding of the problem and of its cause(s) (Davison et al., 2004, Vries, 2007)
Intervention	Design interventions to address the cause (Vries, 2007). These actions should be previously approved by the practitioners and described in detail to document aspects like the timing and nature of each action (Davison et al., 2004)
Assessment	Define unambiguous criteria to assess organization before and after the intervention (Avison et al., 1999, Davison et al., 2004)

Principle of learning through reflection	
Report	Provide detailed descriptions that leave room to multiple interpretation (Avison et al., 1999) and help peers to assess trustworthiness of the obtained results
Reflection	Reflect on the outcomes of each intervention to evaluate the project's success (Davison et al., 2004)
Practical outcomes	Disclose the implications of the study for related domains (Davison et al., 2004)
Implications for the scientific community	Evaluate the value of the theoretical base model(s) employed and consider the transferability and applicability of obtained findings (Hult and Lennung, 1980, Baskerville and Wood-Harper, 1996, Lau, 1999, Davison et al., 2004)

The above principles guided our research. The InovWine research focus was specified in detail in the proposal submitted to the NSRF (National Strategic Reference Framework). It included aims, participating actors, roles and responsibilities, and a plan of action (including deadlines and resources assigned to tasks). Simultaneously, a protocol of cooperation among the organizations involved was conceived. It covered topics like guidelines and forms of cooperation (including access to data), intellectual property rights, and commercial issues.

After project acceptance, we started to study its business model. We supported our research on the knowledge acquired in the literature review and on the outcomes of the previous three case studies. In addition, we began to study topics related to the wine sector (e.g., steps of production, grape diseases, and wine quality) and tried to perceive the interest of the practitioners in the project, in order to match them up with ours. After that, we initiated a research cycle, in which we had the opportunity to clarify concepts and ideas, critically analyze research questions, and understand the capability of BIZ2BIS to discuss, design, and evaluate networked business models and produce a high-level specification for their supporting information systems. Data collection and interpretation made part of the research. We used multiple sources of information and different informants to regard different perspectives that enriched our capacity of evaluation and reflection. Project documentation, Internet pages, books, and technical reports were analyzed. To integrate the opinion of the actors in the study of the business model we held meetings, made phone calls, and conducted semi-structured interviews. We sought divergent data and opinions, tested apparent agreements and explored apparent disagreements (Cunha and Figueiredo, 2002).

The interventions in the networked business model suggested by BIZ2BIS were previously approved by the actors with power to decide. The results of those actions were also used as an additional source of information and enhancement to our research. We developed a report detailing all our steps and reflections (found on the CD enclosed). This document was shared among all the business actors.

4.5.6 Generalization in action research

Action research projects, due to the nature of its intervention can never be repeated (Baskerville and Wood-Harper, 1996). They work with theories applied to specific real-life practical problems, intervene into unique organizational settings, and achieve local findings. These findings are pertinent, at least to the practitioners involved. However, as stated by (Goldkuhl, 2008) several questions may be put: Does this local relevance also imply a general relevance? Are the solutions proposed and used relevant outside the local practice?

The particularities of each setting sustain one of action research's most sharp criticisms: the difficulty to establish the extent to which the outcomes obtained in a specific project can be generalized, and how. Byrne (2005), as well as Blichfeldt and Andersen (2006) suggest that action researchers should look for transferable results. These might be taken and made available in other situations and settings, whether in terms of adopted methodologies or generated theoretical insights. In our research project, we intended to identify knowledge that can be acquiesced and applied in other scenarios to support business models discussion, design, and evaluation.

According to Baskerville and Lee (1999) and Cunha and Figueiredo (2002), when using action research, authors should find support for the epistemological legitimacy of their research on the roots of Critical Rationalism, by Karl Popper (1968, p. 29). In Popper's view, for a theory to be scientifically valid it must lend itself to verification or confrontation with occurrences that may refute it. If the predictions are not accomplished, then the theory is false and possesses no generality. On the contrary, the theory remains valid, until its illegitimacy is not proved - it maintains the status of being falsifiable. According to Popper, scientific progress comes from the rejection of less satisfying theories and their replacement by better ones (Popper, 1982).

Barkervile and Lee (1999) advanced guidelines on the appropriate way in which researchers may lay claim to generality for their research when using action research. The work of these authors goes along the same line as Popper's studies. They advise the researchers to detail the particular empirical conditions that characterize the scenario for which results are obtained. Following the same line of research, Blichfeldt and Andersen (2006) suggested to enhance the discussability of action research by: (a) increasing the transparency of their research processes, (b) declaring the intellectual frameworks brought into action research projects, (c) discussing transferability of findings, and (d) defining accumulation of results. The detailed information can be extremely helpful when researchers lay claim to generality in their study, since this claim would imply that the theory may hold in different settings that "share the same empirical circumstances". Future efforts to enhance the generality of a theory would not involve indiscriminately and randomly collecting more observations, but, rather, would imply the identification of additional conditions on which the applicability of the theory can be tested.

We recognize the arduousness in reporting all the relevant and pertinent aspects of a networked business model. In addition to the complexity of the network configuration and of the business model itself, these environments are rich in covered and exposed dependencies between the actors (e.g., power influences), and subject to external influences (e.g., governmental laws).

The performed literature revision (Chapter 2 and Chapter 3) and the study of previous cases (with strong real-life contexts) contributed largely to the identification of the features that characterize business models. Their integration allowed BIZ2BIS to address business models in a comprehensive way and contribute to face the action research reporting challenge.

The InovWine case enabled us to describe a specific instantiation of the circumstances in which our approach was applied. It offered us the necessary conditions to analyze and evaluate a networked business model and translate the resulting outcomes to the specification of its information system's high-level requirements. A critical analysis of the situation gave us fundamental insights to update the approach and intervene in the scenario under study. The report of the outcomes obtained and the experience itself can be used by future users of the approach to guide their steps in other contexts that share the same business circumstances (in the wine sector, or any other domain). The resulting knowledge revealed the adequacy of our approach to given situations, described how it should be used, enhanced its reliability, and disclosed conditions in which future users may trust it. New business scenarios of study can continuously test its suitability.

4.6 Conclusion

Throughout this chapter we outlined the research strategy conceived to address the research questions laid down in this thesis. Both social and technical issues were considered to influence the business model study and the specification of its information systems' high-level requirements. We adopted an interpretive stand and applied case study and action research according to the characteristics of our cases, since both fit the philosophical assumptions underlying this work. The findings obtained with the case studies presented were used to endow BIZ2BIS with a level of maturity that enabled us to transmit to practitioners a sense of trust and security on its capabilities to enhance and promote their business models. In turn, the close collaboration established with practitioners in InovWine allowed us to enrich the business model's study with their own perceptions of the problem and observe their reactions towards the approach's application in the field. The approach's rigor, validity, and generalization of the research process were also covered.

The last version of our approach is described in Chapter 5. It is the outcome of the performed research, enriched and molded with the contributions of all the presented cases. Its application to a concrete networked business model (InovWine) is exemplified in Chapter 6.

Chapter 5

BIZ2BIS: Business model and IS design

5.1 Introduction

In on our review of the business model literature in Chapter 2, we identified several aspects to take into account when discussing, designing, and evaluating inter-organizational business models. On the one hand, we noticed that many of the available proposals did not focus on networked business models, and, those that did, did not include techniques to promote the alignment of the actors or superficially explored the connections between business models and their supporting information systems. On the other hand, we also became aware that, in spite of the importance that some authors assigned to social factors in the study of business models, there were no indications on how to address them.

In Chapter 3, we discussed how ANT could introduce a social outlook in our approach. We translated its principles and concepts to the networked business models domain and used them as a source of inspiration in the conception of our proposal. ANT's ability to address network configurations showed us the importance of understanding the intertwined web of value propositions, interests, and dependencies among actors. Its ability to align interests geared us to capture the perception of the actors towards the networked business model (the ones satisfied and willing to contribute to the common goal, or the others who are discontent and willing to abandon it) in order disclose clues on how to entice them to participate. ANT inspired the development of a negotiation process to manage the interests of the actors in the business model. In addition, ANT's socio-technical lens showed us networks as an heterogeneous reality built of multidimensional and continually evolving entanglements (Grabher, 2006), where human and non-human actors are treated similarly. This perception was extremely useful, since it provided us with indications on how to consider the social dimension in the study of networked business model scenarios, as well as the role that human and non-human actors possess and their impact on the network. Furthermore, it enabled us to perceive how human interests are materialized in non-human actors and how the latter influences the former. This outlook gave us clues to understand how business and social constraints shape information systems requirements, increasing the chances of developing a technological solution able to satisfy the involved actors.

The insights obtained in Chapter 2 and Chapter 3 inspired us to develop an innovative and practical approach to discuss, design, and evaluate networked business models, which equally contributes to disclose its underlying information system requirements. The approach, which we designated by BIZ2BIS consists of four phases. In *Phase I*, we characterize the network, identifying its actors and their relationships, as well as the structural aspects that influence their behavior. Then, in *Phase II*, we analyze the network and suggest eventual adjustments to better align the interests of the actors. In *Phase III*, we assess the business model stability by verifying if the value propositions bring benefits to all the involved actors. If this happens, there are strong indications that the actors were successfully enrolled and that their interests were aligned. In *Phase IV*, the gathered information about the network and its actors (e.g., relationships, data, and constraints) and the arrangements established to align the interests of the actors are used to detail the high-level requirements of the information system underlying the business model. Each phase is supported by one or more artifacts in which we also integrated the insights obtained from the theoretical contributions in a user-friendly way. This materialization in artifact items, diagrams, and guidelines of application is explained throughout the chapter.

We noticed that, similar to ANT, which is one BIZ2BIS' pillars, our approach should not be perceived as an inflexible procedure that can only be applied as a standard format. We expect it can guide practitioners in their own scenarios of study and that they can translate it according to the needs and characteristics of their own context. As Latour (1987, p. 29) mentioned, any definition (in this case BIZ2BIS) is "in the hand of later users". We will detail BIZ2BIS as follows: in Section 5.2, we explain the outlined plan for its application. Then, in section 5.3, we detail the four phases of BIZ2BIS. For each phase, we describe their purpose, field use, supporting artifacts, and theoretical background. Finally, we present a brief conclusion of the aspects covered by the approach in Section 5.4.

At the end of the chapter, the reader should be able to:

1. Comprehend the outlined plan for the application of BIZ2BIS;
2. Understand the purpose of BIZ2BIS' four phases, their steps, supporting artifacts, as well as the expected insights;
3. Employ the approach to discuss, design, and evaluate networked business models, while deriving their underlying information systems requirements;
4. Adapt BIZ2BIS to the problems, needs, and expectations of each scenario.

5.2 BIZ2BIS outline

When a set of organizations intends to put a business model in place, those responsible for the task face several challenges. They need to conciliate the overarching aims of the network with the individual expectations of its members, obtain their support, and convince them to accept the roles defined for them. The complex dependencies that exist in these environments make it complex to specify in detail a business model idea. The involved actors, including the ones with the power of decision making, usually only have a partial perception of the scenario under analysis, which makes it difficult to detail the ideas in question, detect inconsistencies or problems, and propose alternatives. BIZ2BIS works as a shared and common understanding of the business model that promotes communication, discussion, and collaboration among its participants. The data gathered exposes interactions, influences, aims, activities performed, and the dynamics of the networked business model, which enables the disclosure of the interplay of interests. This wealth of information is used to support an iterative negotiation process that seeks to involve all actors in the search of an alignment for their interests, so that each one can find attractive value propositions that may encourage them to participate in the networked business model. The detailed specification of the envisioned solution for the scenario under study (including its social dimension) and the integration of the actors' viewpoints are valuable tools of BIZ2BIS. Our approach compares the information available with the individual perceptions of the actors in order to disclose threats, solve conflicts, promote collaboration, reinforce the enrolment of the actors, inscribe programs of action, and strengthen the stability of the networked business model. It also takes into account alternative business model scenarios to explore opportunities revealed during the study and to promote discussion of less matured ideas. BIZ2BIS systematically explores connection points between the insights obtained on business models and the requirements of their underlying information systems.

The clues and suggestions obtained using BIZ2BIS should be presented to the decision makers to support their choices. These actors should try to accomplish the network goals and balance them with the expectations of each of the involved actors. Actor satisfaction is of the utmost importance for business model stability. Therefore, BIZ2BIS gives them the opportunity to assess the suitability of the business model based on the proposed solutions. If the reaction is positive, then the approach allows the elicitation of business model requirements to be met by its supporting information systems.

BIZ2BIS is organized in four phases: *Phase I – "Business model characterization"*; *Phase II – "Business model refinement"*; *Phase III – "Stability assessment"*; and *Phase IV – "Information system specification"* (Figure 25). By default, the phases follow a sequential order. However, this configuration does not prevent BIZ2BIS to take into account the dynamic nature of the networks and their capacity to evolve with time, as suggested by Recuero (2004). The approach is flexible enough to interrupt, at any moment, the sequential order of its phases and return to previous ones in order to answer to unexpected network events or to indications ascertained when applying its steps. For instance, disclosed data can give rise to new translations, innovative behaviors can change programs of action, and the appearance or disappearance of an actor modifies the network configuration. Figure 25 expresses this dynamics. The dashed arrows illustrate possible returns to already visited phases and green arrows the decision to progress in a sequential form. For instance, if a new actor is identified, independently of the phase in use, it is mandatory to return to *Phase I*; if an event uncovers unconsidered aims with implications on the alignment of the actors' interests, it is necessary to return to *Phase II*.

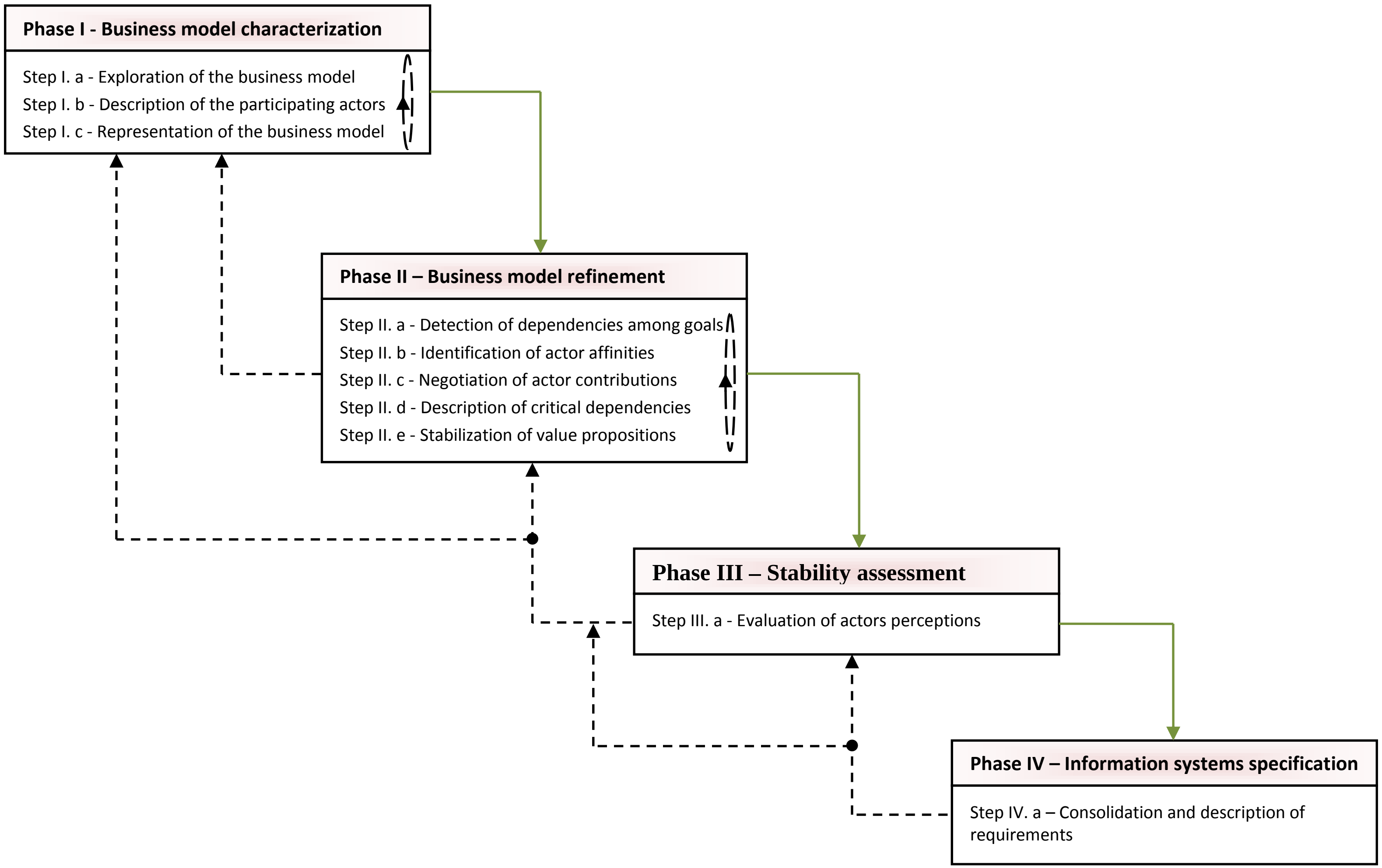


Figure 25: Generic outline of BIZ2BIS

Each phase has one or more steps, supported by idealized artifacts. It is not mandatory to apply all steps in the four phases, use all their supporting artifacts, or follow the sequence suggested for their application. According to the specificities of each scenario, the need to apply the steps of a phase in a different arrangement may arise. Figure 25 represents the dynamics by black ellipses. Analysts should apply the steps in the order that best fits their needs.

5.3 BIZ2BIS step by step

To present BIZ2BIS in detail, we provide a general description of its four phases and of their steps. For each step, we will explain its purpose, present the artifacts that support it and an example of their use, describe how the step should be used in the field and by whom, and discuss its theoretical background. We believe that concrete examples can promote the understandability of the approach. Therefore, for illustration purposes, we use fragments of one of our cases - the GreenHomes business model. When we started to study it, the principal investigator for the project had already established that the aim of the business model was to improve environmental efficiency. He had also identified some interests of the involved actors, such as monitor electricity consumption patterns, adjust energy usage to prices or available supplies, and accessing data provided by the users of the portal. The achievement of these interests, in his opinion, depended on the users' insertion of electricity consumption data per household. How this could be promoted was still an open issue. We used the ideas transmitted by the researcher as the starting point for our study. In the next section, we will start by detailing the steps of *Phase I*, which covers this initial stage. Then, we will cover the following phases, while addressing situations up until the end of the project that may contribute to BIZ2BIS' understanding.

5.3.1 Phase I, from Step I.a to Step I.c – Business model characterization

Phase I should be applied when a problem is identified in an existing inter-organizational business model or a new opportunity. The actors, who detected the required change or conceived the new idea, frame the problem and identify actors, interests, behaviors, and relationships with other actors that can contribute to their envisioned proposal. If they, or the actors with power to decide in the network, recognize the need to discuss their suggestions, and intend to evaluate and improve them, then the conditions to apply BIZ2BIS are gathered. This phase analyzes the business model by looking at its network. It comprises the identification and characterization of the participating actors, as well as their relationships. To assemble a more complete view of the networked business model, it also covers structural aspects that can constrain it, such as governmental legislation and cultural issues. Diverse sources can be used to gather relevant information on the networked business model, such as meetings, interviews, books, reports, scientific content, magazines, and web pages. To enhance the knowledge on the scenario under study, this phase can be applied in simultaneous to several alternative business models. It aims to:

- Characterize the networked business models (goals, opportunities, threats, mutual obligations, shared representations and interpretations, existing rules, available resources/actors, and institutionalized sanctions);
- Identify the actors involved in the network and detail the information about them (network interactions, relationships and flows, roles, and interests);
- Represent the networked business model visually.

Phase I addresses the above aims in three steps with complementary perspectives (Table 10): the first characterizes the network, the second details actors, and the third depicts the interactions among the actors. One or more artifacts support each of the steps. Next, we present those belonging to *Phase I*.

Table 10: Phase I - Steps and supporting artifacts

Phase I – Business model characterization

Step I.a	Exploration of the business model	**Artifact I.a1**	Networked business model chart
Step I.b	Description of the participating actors	**Artifact I.b1**	Actor description chart
Step I.c	Representation of the business model	**Artifact I.c1** **Artifact I.c2**	Flow diagram Flow matrix

5.3.1.1 Step I.a: Exploration of the business model

This step initiates the study of the business model when the actors with power to deliberate its future decide to create a work group to discuss, design, and evaluate it. Analysts should return to this step whenever they detect the need to carry out changes in the conceived solution or update the data in the artifact that supports it.

Purpose

Step I.a describes the networked business model. It allows analysts to broadly specify its main aims, who contributes to its success and how, as well as the provided features. In this first draft, analysts also address settings and structural aspects that can affect the business model context.

Description and illustration of the artifacts

The "Networked business model chart" supports the description of the networked business model. It is composed of the following items:

- Network goals: gathers all the information obtained for each actor, analyzes it, and presents a first draft of the network's goals;

- Network opportunities: describes advantageous circumstances that can arise if the network is created;
- Network threats: identifies possible threats to the network creation or maintenance;
- Mutual obligations and expectations: describes present and future established commitments and provides indications about the degree of cooperation in the network;
- Shared representations and interpretations: identifies common codes, languages, and narratives that guide actor behavior;
- Existing rules: represents the network policies that the actors must adhere to;
- Available resources/actors: identifies the existing resources and the actors who provide them;
- Institutionalized sanctions: describes the actions that must be carried out if the actors do not follow an acceptable behavior.

At the bottom of the chart, we added a row with its version, author, and date. This procedure was extended to all other artifacts. Our aim was to show the repertoire of documentation produced while using BIZ2BIS. The "Networked business model chart" records information that is subject to several refinements throughout the study (e.g., a new interview can change how a certain topic was considered) and often supports the use of the reaming artifacts. To clarify how information was progressively obtained and the evolution of its content, we also included in BIZ2BIS the notation:

- ~~Strikethrough~~: identifies incorrect assumptions;
- Normal text (black font): represents information already obtained;
- Normal text (green font): describes new information that is being obtained at the present time;
- CAPITAL LETTERS (RED FONT): identifies problems detected in the studied scenarios and points out alternatives that may imply profound changes in the project. For instance, the introduction of a new actor, or a new business model direction.

The use of the described notation, combined with the version control, highlights new data whenever it is obtained. Table 11 illustrates the use of this artifact with information from the GreenHomes' business model.

Table 11: “Networked business model chart” applied to the GreenHomes case

Business model scenario	GreenHomes	
Network goals	Improve environmental efficiency (individual and global) through GreenHomes	
Network opportunities	New scientific discoveries regarding individual/collective environmental behavior Inclusion of new sensors (e.g., to control water and gas consumption , or indoor air quality) Connection to other social networks Create plug-ins (e.g., new data)	
Network threats	Lack of motivation to insert data manually Privacy issues Lack of interest in environmental issues Lack of trust in the network (e.g., due to bugs, design glitches, or analysis errors) The existence of rival platforms (e.g., Google Power Meter)	
Mutual obligations and expectations	Users periodically input data and receive tips that will improve their energy consumption The Portuguese Environmental Organization advertises the platform and contributes its expertise to the platform development. In return, it has access to GreenHomes' data iTEAM project maintains the platform and gets data for research	
Shared interpretations and representations	Environmentally friendly behavior Common household typology Common measures for the analyzed resources	
Existing rules	Data should be input manually (weekly) and via sensors every day (only for a small number of selected users) The Portuguese Environmental Organization should provide weekly tips	
Available resources/actors	Hardware and technical skills/iTEAM project Environmental tips/The Portuguese Environmental Organization and Users Data/Users	
Institutional sanctions	Banned from the platform	
Version: **0.3**	Date: **21/07/2010**	Author: **Cristina Costa**

<u>Field use</u>

When analysts meet actors who have decide to analyze a particular networked business model (a new idea or one already in use) they should explain how BIZ2BIS will be applied and the insights it will provide. They should also emphasize the importance of fostering collaborations with all involved parties in order to encourage their participation. Their feedback is fundamental to understand the business model and provides additional assurances that their viewpoints are being considered.

Analysts, or any other element of the work group, should contact the actors that are, in their opinion, involved in the business model to schedule a meeting that may clarify their availability to collaborate and the roles that they may carry out. If analysts detected scheduling conflicts, they should appoint individual interviews. If in-person meetings are unfeasible, other options can be considered such as web conferencing, phone calls, and e-mails.

Analysts should fill in the “Networked business model chart” during the carried out meetings or interviews, accordingly. The chart fields should be used to guide and systematize the questions asked. Recorded conversations follow the same procedures. When presenting the gathered information to all the involved actors, analysts may have to omit confidential information previously obtained (e.g., fears an actor might have regarding another). The content of each field should be continuously refined throughout this step, as the actors provide new data. The chart provides a succinct view of the main characteristics of the networked business model and can be used as a first step to promote its understanding and discussion among actors.

Theoretical background

Our early inspiration to design *Step I.a* came from ANT’s concepts of problematization and interessement. They helped us to address the moment in which the actors interested in considering new networked business model ideas, or changing existing ones, decide to detail and analyze them using BIZ2BIS. These actors form a group that can include entities as diverse as the proponents of the idea, funding bodies, and project leaders. In BIZ2BIS, this group corresponds to ANT’s focal actors. Eventually, the project leaders may require that the analysts using BIZ2BIS also be included in the group to support discussions on future decisions. In our approach, following ANT’s problematization, this group should frame the networked business model under study and identify entities with interests that are consistent with it. Inspired by the concept of obligatory passage point, the group should also make itself irreplaceable in the proposed solution for the business model, or at least some of its elements. Thus, the involved parties should define a course of action under their control that must be followed by all actors if they want to achieve their interests.

BIZ2BIS uses the “Networked business model chart” to characterize the network. This chart is where the influence of Structuration Theory and Social Capital’s dimensions is more noticeable. These inspired us to identify factors with impact on the behavior of the actors and helped contextualize the information obtained when following the network interactions (as proposed by ANT). The factors relevant to enhance our understanding were merged with others from the business model domain and gave rise to the fields that we explain below:

- “Network goals”: corresponds to establishing ANT’s obligatory passage point. However, the need to define what the networked business model must achieve is also addressed in business model definitions and components (Hamel, 2000, Alt and Zimmermann, 2001, Al-Debei et al., 2008).

- "Network opportunities" and "Network threats": were inspired by SWOT analysis (Andrews, 1971). They have the aim of performing a scan of the network external environment to perceive possible opportunities or problems. For instance, emergence of new technology, alternative regulations, or the surfacing of substitute services.
- "Mutual obligations and expectations": was influenced by the Social Capital's relational dimension. It was introduced to clarify mutual relationships in the network (for instance, trust and reciprocity).
- "Shared representations and interpretations": follows the principles proposed by Structuration Theory's interpretive schemes and Social Capital's cognitive dimension. It specifies common codes, language, and narratives (shared knowledge), aiding in the task of interpreting the networked business model.
- "Existing rules": is inspired by Structuration Theory (norms are one of its modalities) and in Social Capital (the relational dimension integrates network norms). This information explains why the actors follow certain behaviors in a particular context and is also addressed in business model studies, for instance Morris et al. (2005) and Gulati et al. (2000).
- "Available resources/actors": is frequently addressed by authors in the business model domain (Tapscott et al., 2000, Hamel, 2000, Gulati et al., 2000, Papakiriakopoulos et al., 2001, Afuah and Tucci, 2003, Osterwalder, 2004, Allee, 2008, Bouwman et al., 2008c), showing its relevance to the field. It is also based on Structuration Theory (facilities are one of its modalities).
- "Institutionalized sanctions": is inspired by Structuration Theory interaction sanctions and by the social sanctions from Social Capital. It may clarify what the network actors regarded as sufficiently dissuasive.

Some of the above items (for instance, "existing rules", and "institutionalized sanctions) can be considered black boxes. Until questioned, BIZ2BIS will not "open" them.

5.3.1.2 Step I.b: Description of the participating actors

The information gathered through the "Network business model chart" summarizes the main guidelines established for the business model by its proponents. It sets out how aims and plans can be achieved (e.g., commitments of the actors towards the networked business model, their contribution to achieve the defined aims, and the resources to use). In addition, it addresses contextual aspects that may influence the outlined aims (e.g., governmental laws, economic restrictions, and cultural issues). The wealth of information on the networked business model creates favorable conditions for detailing the actors of the networked business model, which we addressed in BIZ2BIS *Step I.b "Description of the participating actors"*.

Purpose

Step I.b identifies the actors that participate in the networked business model, details their roles, relationships, and expectations. Knowledge about the actors enhances the visibility over the interplay of interests and supports analysts to delineate the network (including its boundaries). It also discloses ways of encouraging actors to strengthen the business model and reveal indications to increase its chances of acceptance and adoption. Furthermore, when BIZ2BIS exposes the vision that each actor has for the business model, it can help others to improve their own perception, as well as the conceived business model. Since data about actors is vital for the approach, not identifying all the ones with impact on the aims of the network can be disastrous and undermine its achievement. The data on each actor should be filled in the “Actor description chart” that we present below.

Description and illustration of the artifacts

For each actor in the “Actor description chart” we take into account the fields:

- “Network interactions”: depicts the interactions of the actor in the network. Disclosing all the established connections enables analysts to perceive the existing relationships and unveil the actor network configuration.
- “Relationships and flows”: details the relationships of the actor and identifies the business flows (e.g., information and services) associated with each relationship. It clarifies the network interactions and searches for indications of future alliances or possible conflicts that can change the network dynamics.
- “Roles”: describes the activities carried out by the actor. This field covers aspects that can be used to detail the business model and the functionalities that its supporting information system should make available to its users.
- “Goals”: identifies the individual interests of the actor. This information is critical to manage the alignment of interests among the actors and to define the network goals.

Table 12 illustrates the “Actor description chart” through the description of the “Monitored user” in GreenHomes.

Table 12: “Actor description chart” applied to the GreenHomes’ Monitored user

Description of the actor	**Monitored user**
Network interactions	GreenHomes, other users (Standard and Monitored), sensors, and Portuguese environmental association
Relationships and flows	Introduce consumption data through sensors in GreenHomes Introduce personal data in GreenHomes Share consumption data with other GreenHomes users, iTEAM project and Portuguese environmental organization Share tips with other users Receives free sensors iTEAM project Establish an agreement with iTEAM project to improve environmental conditions Use the services provided by GreenHomes
Roles	Authorize sensor installation Introduce personal data Fill out questionnaires Monitor sensor operation Provide authorization for use of data
Goals	Receive free sensors Monitor own behavior in terms of energy consumption Compare consumption with average consumption of others (e.g., depending on regions and typologies) Receive hints to reduce cost and improve energetic behavior Participate in the social networks with friends
Business model: GreenHomes	**Version and Date:** 0.3, 21/07/2010 **Author:** Cristina Costa

Field use

For each identified actor, analysts should appoint an interview to address the fields of the “Actor description chart” and fill it in. If there are scheduling conflicts, they should choose alternative forms of contact like sending the artifact in writing. The specificities of actors belonging to a group may lead them to adopt divergent behaviors. In this case, in order to capture their different point of views, we advise analysts not to consider the group as a single actor but to individually characterize its distinctive actors.

In interviews and meetings with the actors, analysts should promote their issuing of opinions and encourage them to express their vision of the business model, detail their interactions, and point out the aims they intend to achieve. The information obtained about the actors improves knowledge on the business model, for instance it aids in the discovery of opportunities and threats that can be explored in advance. Since business models embody the characteristics of the domains for which they are designed (e.g., an endeavor of organic food in the Middle East), complementary sources of information aid to clarify the scenario under study. Thus, analysts should ask actors for additional material about the business model such as books, reports, laws, Internet pages, and journals to improve their understanding of the context under study. The role of non-human actors must also be considered. For this to be possible, human actors should describe what they expect from the former. As the use of BIZ2BIS gradually provides additional data on the actors, the artifact content should be continuously refined. Analysts should compare this expressed perception with the vision of the business model proponents in order to support the aims of the network and the individual expectations of the actors.

When applying this step, it is important to verify if the actors point out relationships with others that have not yet been identified. In such cases, each of these revealed actors must also be interviewed and then be recursively asked to indicate all their connections. The iterative search continues until analysts do not identify more actors, or consider that they have a residual influence in the networked business model. At a later stage, business analysts may decide to discard some of the identified actors, due to their irrelevance for the business model. In the carried out interviews new data about the topics addressed in *Phase I* may arise due to the close relationship between the actors (*Step I.b*) and the network where they operate (*Step I.a*). Whenever this takes place, analysts should return to the step that addresses the data in question and update the necessary artifact(s). Analysts should apply a similar procedure when they disclose data on the actors in *Step I.a*.

Theoretical background

Distinct backgrounds influenced the development of *Step I.b*. To obtain clues on how to identify the actors in a networked business model, we started by exploring links between ANT's concept of actor and the literature on the definition of stakeholder. For example, Freeman (1984) defines a stakeholder as any group or individual who can affect or be affected by the achievement of a firm's objectives. Bryson (2004) presents variants to this definition, which differ from how inclusive stakeholders are. These differences are justified by the different purposes and distinct contexts in which researchers and practitioners apply this research topic (Pouloudi and Whitley, 1997). For instance, Eden and Ackermann (1998) state that stakeholders can only be people or groups who have the power to directly affect the future of the organization. The absence of power removes the stakeholders' status. In contrast, others consider a broader scenario, including the nominally powerless (Johnson and Scholes, 2002). In BIZ2BIS, we use an inclusive stance: each element that can influence or be influenced by the networked business model - directly or indirectly - should be regarded as an actor (independently of being a human or non-human actor). In *Step I.b*, we were also inspired by ANT and its lens of heterogeneous networks (Chapter 3) that led us to follow the actors and describe their behavior, as well as by the snowball method (Hanneman, 2001). This method is associated with the Social Network Analysis (SNA), which is inherently an interdisciplinary endeavor. SNA developed from a propitious joining of social theory and application, with formal mathematical, statistical, and computing methodology (Wasserman and Faust, 2008) and enables the mapping of network interactions. Similarly to BIZ2BIS, SNA focuses on relationships among social units and supports its analysis on actor data. One of the available procedures to gather the information is the snowball method (Hanneman, 2001), which begins with a focal actor (or a set) that is asked to identify ties to other actors. Each of these actors is then recursively requested to also provide all its ties. This process continues until no new actors are identified, or until the analyst decides to stop (usually for reasons of time and resources, or because the new actors are insignificant to the network). This method has two potential limitations. First, actors who are isolated are not located. Second, there is no guaranteed way of finding all the identified actors. To strength the method, we carefully selected the initial set of actors. We also used a tactic suggested by Pouloudi and Whitley (1997) to conceive this step. Their proposal accounts for the specificities of inter-organizational environments in the identification of stakeholders, namely the dynamic nature of these environments and the complexity of the existing relationships. It is based on four principles:

- Principle 1 - Stakeholders depend on the context and time frame: the inter-organizational domain in which the network operates affects the set of stakeholders and since the network has a dynamic nature, this set should be regularly reviewed.
- Principle 2 - Stakeholders cannot be viewed in isolation: the complexity of the stakeholders' interactions (e.g., power, trust, conflict, and cooperation) must be taken into account. Given that the identification of one stakeholder can lead to others, this process needs to be iterative.
- Principle 3 - The position of each stakeholder may change: stakeholders can modify their viewpoints as time goes by, which demands that we observe them for a longer period of time.
- Principle 4 - Feasible options may differ from the stakeholders' wishes: the stakeholders possess different interests that must be articulated to achieve a common solution. The feasibility of stakeholders' wishes is also restricted by technological, economical, and political factors.

To identify actors that "really matter", BIZ2BIS follows a tactic inspired by ANT and led by Pouloudi and Whitley's principles, which is similar to the snowball method. After identifying the initial actors, they are recursively asked to identify all their connections and detail their activities. BIZ2BIS stops this iterative search when it does not identify more actors or when they have a residual influence in the network business model. During the search, BIZ2BIS considers the context of the network and its dynamic nature. It integrates the role of the actors in the context of the networked business model and promotes the continuous demand for information, while updating the corresponding artifacts. Since BIZ2BIS uses the "Actor description chart" to characterize each actor, we will now present what led us to set each of the artifact fields:

- "Network interactions" and "Relationships and flows": both these fields respect ANT's recommendation of following and describing the actors. The item "Network interactions" centers its attention on perceiving the entire network configuration. This perspective is also suggested by the Social Capital's structural dimension. In the last years some proposals in the business model domain also underlined the importance of considering business models operating in network configurations, for example the ones presented by Bouwman et al. (2005b) and Gordijn and Akkermans (2003). In turn, the field "Relationships and flows" details the identified interactions, providing hints about business flows to address in the business model. The relevance of detailing each actor's relationships in BIZ2BIS was also supported by the Social Capital's relational dimension. Moreover, the importance that business model definitions and components (Timmers, 1998, Weill and Vitale, 2001, Kallio et al., 2006, Stanoevska-Slabeva and Hoegg, 2005) assigned to tangible and intangible values exchanged among actors played an important role in our decision to include this field in the artifact. Studies on networked configurations (Tapscott et al., 2000, Parolini, 1999, Allee, 2000) also underlined this idea.

- "Roles": corresponds to ANT's program of action that inscribes the behavior of the actors in the network, materializing the ANT concept of inscription. The description of the actor's roles is also addressed in business model theory (Timmers, 1998, Alt and Zimmermann, 2001, Gordijn, 2002, Osterwalder, 2004, Parolini, 1999, Allee, 2008).
- "Goals": was influenced by contributions in the business model domain that underline the need to perceive the individual goals of each actor (Al-Debei et al., 2008). It also gathers fundamental information to manage the alignment of interests among actors and clarifies how the network goals can be refined based on the actors' individual expectations.

5.3.1.3 Step I.c: Representation of the business model

The knowledge obtained on the network (*Step I.a "Exploration of the business model"*) allied with the one on the actors (*Step II.b "Description of the participating actors"*) details the conceived business model, enables its representation, and encourages its discussion. However, BIZ2BIS dispersed this information by several artifacts in the form of text. To synthesize and represent it in an expedite way, BIZ2BIS offers two different outlooks for the business model data in *Step I.c*. This step is particularly helpful at the end of *Phase I*, but it should be used whenever the need to represent the envisioned solution for the networked business model arises. For instance, if transformations in the business model take place in *Phase II*, it can be useful to depict and discuss them. The versions of the artifacts used in this step reproduce the proposed solutions for the business model, and thus its evolution.

Purpose

It visually assembles and summarizes the business flows ascertained among all the identified actors in the previous two steps, based on the data collected through the "Networked business model description chart" and the "Actor description chart". The gathered information can be presented in the form of two artifacts: the "Flow diagram" and the "Flow matrix". Since these artifacts focus their attention on depicting the business flows among actors, they provide a compact representation of the ones identified in *Step I.a* and *Step I.b*.

Description and illustration of the artifacts

The "Flow Diagram" depicts the business model inspired in a graph notation, in which the nodes represent the actors and the arrows the direction of the business model flows. It can be used to illustrate a conceived business model or to gradually construct it by introducing the actors and the business flows step-by-step. The latter option helps explain adopted solutions and discuss alternatives, which suits brainstorming situations.

The business flows represented in the artifact are categorized in four types: material or service, finance, information, and intangible connection (e.g., reputation, influence, customer loyalty, and cooperation). To enhance readability, we organized the "Flow diagram" in layers that can be analyzed in isolation (just one type of flow) or overlaid (several flows) (see Figure 26). The purpose of this artifact is to supply analysts with different point of views that should be used according to their subject of study.

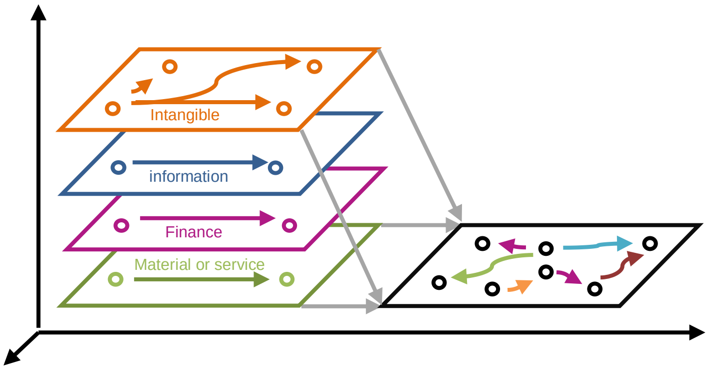


Figure 26: Layers of flows

Figure 27 exemplifies a "Flow diagram" for our illustrative example (GreenHomes). The artifact depicts all the business flows in just one layer (e.g., inserted data, established cooperation, and data analysis) because the disclosed data does not make the diagram too complex or dense. Similar to the conceived business model, each involved actor is considered a network in itself, with its own characteristics and relationships that can be explored. In the graphical representation of the actors, it is possible to introduce extra details: for instance images or textual descriptions. To illustrate this feature, we used a different image for human and the non-human actors. Since the specificities of actors belonging to a profile may be relevant to the business model, the artifact allows the possibility to establish relationships of specialization among the actors. We illustrate this feature in the example below by addressing two types of users: "Standard" and "Monitored".

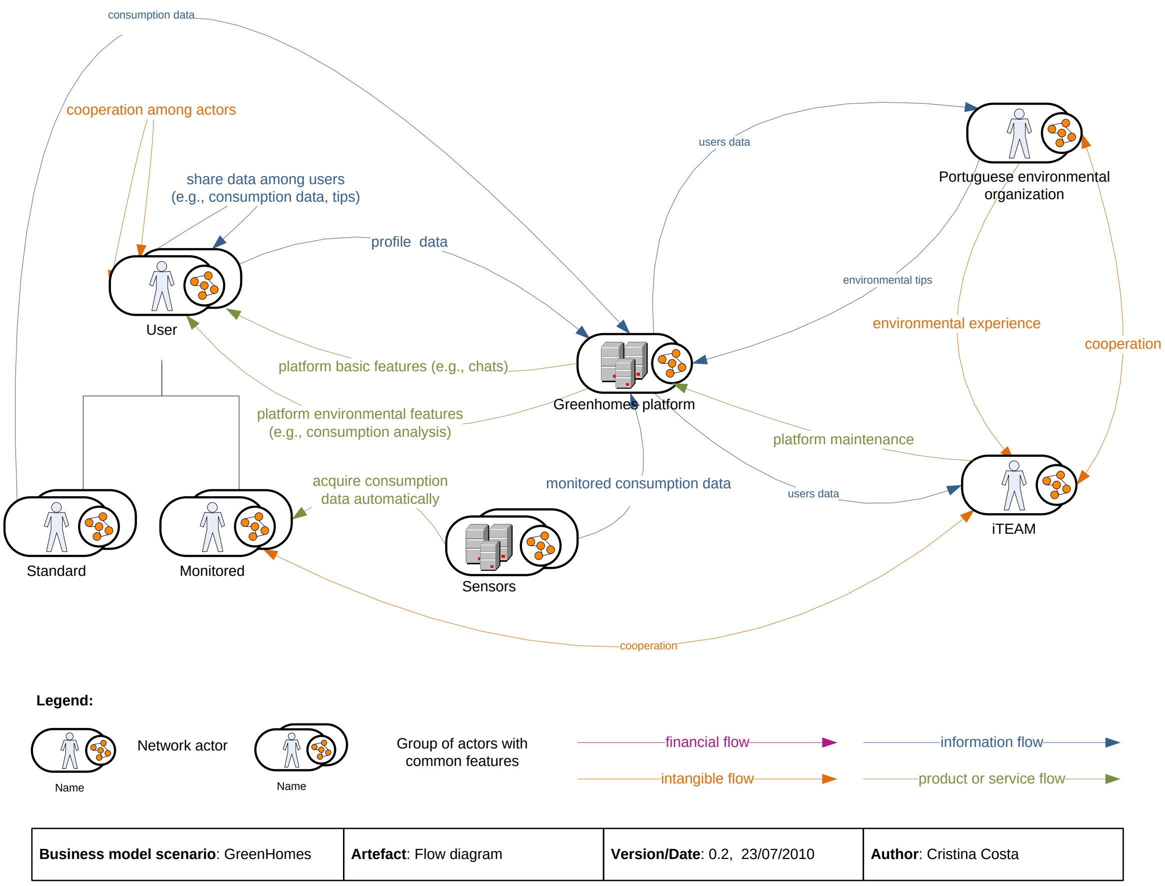


Figure 27: “Flow diagram” applied to GreenHomes

We confronted situations in which people, who were not familiar with a particular business model, were not willing to follow intricate configurations in a “Flow diagram” to understand it. Therefore, we developed an alternative representation: a “Flow matrix”. In this artifact, each actor in one row is intersected with the remaining ones in the columns, and the flows among them are placed in their overlapping area. With this alternative layout, we provide a condensed and prompt representation of the business flows per actor. The information in the “Flow diagram”, presented in Figure 27, is alternatively displayed in Matrix 1. The matrix should be read as indicated by the red arrow, starting with the “actor-source” (lines) and moving upward to the “actor-target” (columns). For instance, “Standard user” inserts consumption data in the GreenHomes’ portal.

Flow Matrix	ACTOR - TARGET						
ACTOR - SOURCE	User	Standard User	Monitored user	GreenHomes Platform	Sensors	iTEAM project	Portuguese environmental organization
User	- Cooperation - Share data among users (e.g., consumption data, tips)			- Profile data			
Standard user				- Consumption data			
Monitored user						- Cooperation	
GreenHomes Platform	- Platform basic features (e.g., chats) - Platform environmental features (e.g.,					- Users data	- Users data
Sensors			- Acquire consumption data automatically	- Monitored comsumption data			
iTEAM project			- Cooperation	- Platform maintenance			- Cooperation
Portuguese environmental organization				- Envrironmental tips		- Cooperation - Environmental experience	
	Business model: GreenHomes		**Version and Date:** 03, 21/07/2010		**Author:** Cristina Costa		

Matrix 1: “Flow matrix” applied to GreenHomes

<u>Field use</u>

When analysts decide to provide a visual representation of a business model through a “Flow diagram”, they should support their representation on the information collected in the “Actor description chart” and “Networked business model chart”.

Analysts should start by disposing all the identified actors in the diagram. Then, they should consider the roles of the actors and represent their resulting flows. Data on these topics is available in the “Actor description chart”, in the fields “Network interactions”, “Relationships and flows”, and “Roles”. Details on the network context that may influence the actions of the actors are available in the “Networked business model chart”, in the fields “Mutual obligations and expectations”, “Shared interpretations and representations”, “Existing rules”, and “Available resources/actors”.

The “Flow diagram” and “Flow matrix” address the same data, thus it is irrelevant which of the two is used first. However, while the former is more suitable to progressively describe an envisioned solution and to support a brainstorming activity, the latter lists the business flows, which originate from an actor and shows their destination (it avoids the analysis of the graphical notation of the “Flow diagram”). When analysts use the “Flow diagram” to support brainstorming, they should explain the business model from scratch and contextualize the information that is gradually added to facilitate its understanding. The exposed knowledge provides actors with the necessary background to participate and contribute to the business model discussion in a more reasoned way.

The “Flow diagram” and the “Flow matrix” should be used whenever the need to show a relevant version of the business model arises (e.g., a point of departure, or the outcome of a carried out negotiation). The consecutive versions of these artifacts reproduce the go-between steps of the idealized business model, as thus its evolution. Furthermore, the ultimate version of the business model is an excellent instrument to facilitate the first contact of the team responsible for the development of the information system with the adopted business model. Its ability to synthesize the gathered information and represent adopted options easily provides the main guidelines of the business model.

Theoretical background

We based *Step I.c* on the information gathered through *Step I.a* and *Step I.b*. For this reason, in a similar way, it encompasses recommendations from ANT, Structuration Theory, and Social Capital (e.g., following the actors, describing their relationships, defining a program of action for the network, and considering its context). These contributions were combined with insights from the business model domain focused on business flows and activities carried out by the actors.

5.3.2 Phase II, from Step II.a to Step II.e – Business model refinement

Phase I enables analysts to gather a detailed description of what was planned for the networked business model by its proponents, as well as the expectations of all those involved in that venture. The knowledge gained is used as a starting point for *Phase II*, which supports the search for common aspirations, the discovery of possible collaborations, and the conceptualization of alternative scenarios that may maximize gains and minimize efforts. This phase helps analysts understand to what extent the interests of all actors are aligned and how they contribute to the network overarching goals. It also aids analysts to detect occurrences that may compromise the business model and propose alternatives. For instance, if actors show some resistance to carrying out the activities envisioned for them by the business model proponents, it is relevant to perceive their reasons, minimize their fears or disinterest, and encourage their involvement. *Phase II* addresses the need to perform enhancements by providing a negotiation mechanism that looks for alignments among actors that may contribute in strengthening the idealized business model.

According to Fisher and Ury (1991, p. xi) “Negotiation is a basic means of getting what you want from others, it is a back-and-forth communication designed to reach an agreement when you and the other side have some interests that are shared and others that are opposed”. It involves interdependent actors and attempts to influence and persuade in order to reach a consensus that respects, as much as possible, the views of the ones involved. This becomes particularly acute in network scenarios in which the need to solve diversified and conflicting interests demand sensitive re-assessments and modifications as new insights arise. Occasionally, the information obtained in *Phase II* discloses hints that might cause analysts to return to *Phase I* and reconsider options already taken. *Phase II* takes an optimistic view of the negotiation process, searching for a win-win proposal based on the assumption that the actors are engaged in a positive-sum activity in which they create value as a result of negotiating. It aims to:

- Disclose how the achievements of each actor can be used to support the goals of the networked business model;
- Compare the vision conceived by the proponents of the business model with the perceptions and interests expressed by each actor;
- Identify goals that may be compromised and that may jeopardize the networked business model;
- Detect goals shared among the actors and explore the establishment of collaborations to support their achievement;
- Promote negotiations among the actors in order to explore proposals that might mitigate detected problems;
- Propose adjustments in the network to align the interests of the actors and motivate their participation in the envisioned solution;
- Achieve a stabilized version of the value propositions provided by the business model.

To address these aims, we conceived the steps and artifacts in Table 13.

Table 13: Phase II – Steps and supporting artifacts

Phase II – Business model refinement

Step II.a	Detection of dependencies among goals	**Artifact II.a1**	Common goal diagram
Step II.b	Identification of actor affinities	**Artifact II.b1**	Actors/Goals affinity chart
Step II.c	Negotiation of actor contribution	**Artifact II.c1**	Negotiation diagram
Step II.d	Description of critical dependencies	**Artifact II.d1**	Dependency flow diagram
Step II.e	Stabilization of value propositions	**Artifact II.e1**	Business flows/Value propositions chart

To achieve this purpose, we start by concentrating on each actor's interest and understanding how they can contribute to the network. Then, we search for possible scenarios of collaborations that can reinforce the configuration of the idealized network. Similarly to what was proposed for the preceding phase, it is necessary to continuously update the content of the artifacts, as extra information is gradually obtained.

5.3.2.1 Step II.a: Detection of dependencies among goals

Step II.a begins by detailing how the proponents of the business model idealized the participation of the involved actors in the network, and then, based on the information transmitted by them, looks for signs of potential inconsistencies, misinterpretations, or conflicts. A more thorough analysis of possible problems and the search for their resolution is addressed in *Step II.b*, *Step II.c*, and *Step II.d*. When analysts achieve a stable version of the networked business model, its value propositions must be listed in *Step II.e*. Taking into account that *Step II.a* analyzes data gathered in the steps of *Phase I*, changes in one step may imply adjustments in another.

Purpose

Step II.a presents how the goals of each actor contribute in reaching the aims of the networked business model. It also exposes the dependencies among the goals and discloses how individual expectations interlock in a network of interactions that directly influence the ultimate business model objective. Furthermore, it enables the exploration of appealing synergies (e.g., possible cooperation), or compromising situations (e.g., the implications of an actor desertion) that can support or jeopardize the accomplishment of the business model goals. To detail dependencies among goals, *Step II.a* also includes control variables, such as targets, that can influence their achievement.

Description and illustration of the artifacts

The "Common goal diagram" exposes the dependencies among the goals of the actors and how these influence the ultimate purpose of the networked business model. At the top of the diagram it appears the network goal(s). Below, the diagram depicts the goals of the actors in several lanes, one per actor. The bond among actors' goals is represented through arrows. Figure 28 illustrates a "Common goal diagram", in the context of the GreenHomes business model.

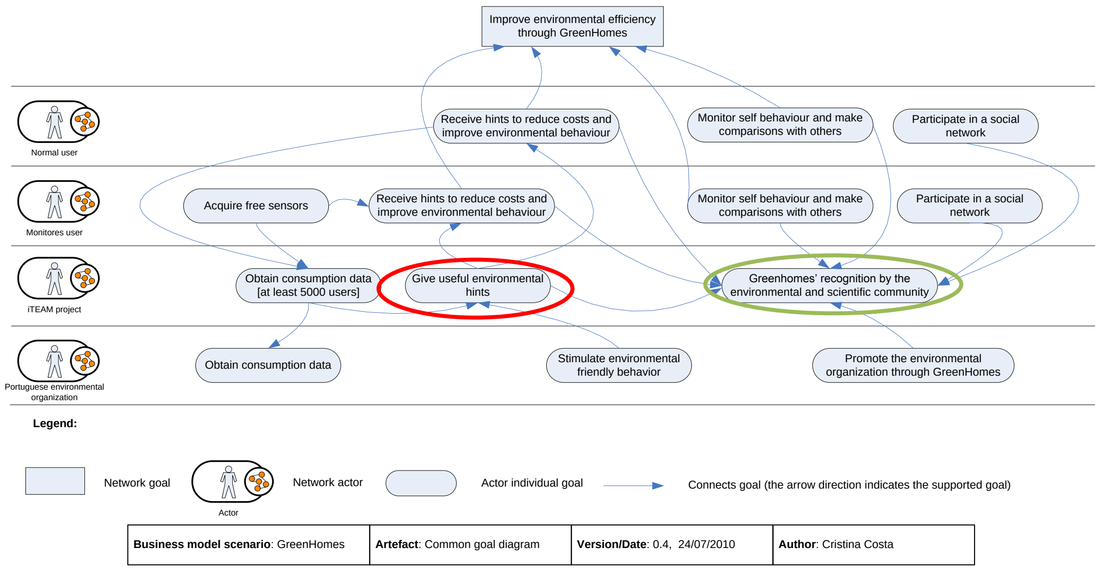


Figure 28: "Common goal diagram" applied to GreenHomes

The goal "Give useful environmental hints" (red ellipse) depends on the goals "Obtain consumption data" (of the iTEAM project actor) and on "Stimulate environmental friendly behavior" (of the Portuguese environmental organization actor). Together, these three goals gather the conditions to satisfy the users' expectations of reducing costs and improving their ecological conduct (goal "Receive hints to reduce costs and improve environmental behavior"). Moreover, they contribute in accomplishing the network aim. It is also possible to show that the goal "GreenHomes recognition by the environmental and scientific community" (green ellipse) is extremely dependent from the user's goals. This is an alert: if the users do not accomplish their goals, the business model is at risk. Figure 28 also exemplifies the use of a target. In the "Obtain consumption data" goal, the label "[at least 5000 users]" is a preliminary indication of the number of users required to justify the interest of the iTEAM project on GreenHomes. If this value is not reached, the goal can be seriously compromised, consequently affecting the business model.

<u>Field use</u>

Analysts should start *Step II.a* by consulting the goals that the networked business model should achieve in the "Networked business model chart" (fields "Network goals" and "Network opportunities"). They should be placed at the top of the "Common goal diagram". Then, analysts should verify from the goals expressed by each actor in its corresponding "Actor description chart", the ones that contribute (directly or indirectly) to the achievement of the networked business model goals. Analysts should also display these individual goals in the diagram (a lane for each actor) and expose the dependencies among them (including the ones defined for the network). If possible, they should use this diagram in collaboration with practitioners. Their knowledge on the domain under study makes it easier to establish existing relationships and clarify certain issues that still raise doubts. They can provide additional viewpoints that can aid analysts in realizing the importance and impact of their participation.

The exposed dependencies among the actors' goals offer clues on how they should be engaged in the network. However, infeasible occurrences can be detected (e.g., an actor with a relevant goal can refuse to enroll, or may not gather the conditions to accomplish it). Therefore, in the final stage of *Step II.a*, analyst should use all the gathered information to disclose in the "Common goal diagram" the goals that are more difficult to achieve and thus may compromise the network. They should also try to understand the relevance of those goals. Preferably, actors should make this relevance explicit; if not, analysts should use the number of identified dependencies as an indicator. The goals that stand out as critical must be addressed in the following steps of BIZ2BIS.

<u>Theoretical background</u>

The use of the "Common goal diagram" was mainly inspired by ANT's concepts of problematization and interessement, since it encompasses attempts to define how actors can contribute with their own goals for the ultimate purpose of networked business models. Its visual representation, however, suffered influences from the Balanced Scorecard Strategy Maps (Kaplan and Norton, 2006). Their capacity to break down strategic aims into perspectives and show relationships among them inspired us to show whether some actors' goals have been accomplished at the expense of others and how they could influence the network aim (exposing the cause and effect chain). The relevance of measuring the performance of these strategic aims (Kaplan and Norton, 2006) also led us to include control variables in our diagram (e.g., targets) to be more accurate about conditions that affect the achievement of the goal.

5.3.2.2 Step II.b: Identification of actor affinities

In spite of the actors' individual aims, they can share common goals. This context of many interested parties must be managed to respect and ensure actors' expectations without compromising the aims of the networked business model to which they belong. In *Step II.b*, analysts congregate all the information gathered on the goals of the actors and based on it explore shared expectations and promote collaborations that may encourage their participation.

<u>Purpose</u>

Step II.b supports the identification of goals common to the actors participating in the business model. It provides insights on the possibility of exploring innovative forms of collaboration among them that can maximize benefits and reduce efforts. Furthermore, it keeps account of the actors with more stated interests and of the more shared goals, providing indications about the commitment of the actors and on the relevance of the goals.

<u>Description and illustration of the artifacts</u>

Step II.b uses the "Actors/Goals affinity chart" to map the actors (first column) with their identified goals (first row). If a certain actor intends to accomplish a given goal, an "X" is placed at their intersection, which allows the identification of the more shared goals and of the actors with more detected interests. Due to the importance of this outcome, for instance an actor that possess many goals is, most likely, committed to the network and a goal shared by numerous actors is, almost certainly, essential for the business model, we decided to highlight these actors and goals with a different color. Table 14 illustrates how this artifact can be applied to some aspects of the GreenHomes' business model. For instance, it shows that "Standard users" and "Monitored users" have many goals in common, but that these are not shared with the other actors. This is a sign of network debilities. The goals "Achieve GreenHomes recognition by the environmental community" and "Improve environmental behavior" are the exception to the lack of common interests. They are shared by all the actors, revealing their importance. Yet, these two goals are not crucial for all the actors (for instance, "Standard users" can enhance its consumption results through other service providers, like www.edp.pt), which can compromise the business model. It is also interesting to note that the actor "Monitored user" has a higher number of goals than the "Standard user". The former has the advantage of receiving free equipment, which reinforces the engagement of this user.

Table 14: "Actors/Goals affinity chart" applied to GreenHomes

Actors / Goals affinity chart	Achieve GreenHomes recognition by the environmental community	Improve environmental friendly behaviour	Monitor self behaviour and compare energetic behaviours	Obtain consumption data	Participate in a social network	Receive hints to reduce cost and improve energetic behaviour	Participate in research experiment and receive free sensors	Promote the Portugue environmental organization though GreenHomes	Research and obtain scientific recognition	**Total amount**
Monitored user	X	X	X		X	X	X			**6**
Normal user	X	X	X		X	X				**5**
iTEAM project	X	X		X					X	**4**
Portuguese Environmental Organization	X	X		X				X		**4**
Total amount	**4**	**4**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	
Business model: GreenHomes	**Version and Date:** 0.3, 24/07/2010					**Author:** Cristina Costa				

Field use

In *Step II.b* analysts should consider all the goals expressed by the actors in *Step I.b "Description of the participating actors"* and the influences disclosed in *Step II.a "Detection of dependencies among goals"*. They should start by comparing the goals detailed in the "Actor description chart" of each actor (*Step I.b*), and identify those that are common. The results show the goals that each actor possesses and the number of actors that share a common goal. For readability, analysts can use colored lines and columns to highlight the ones with higher values. The calculated values provide valuable indications that analysts should use to explore clusters created around common goals and synergies among actors with common purposes. Based on the obtained insights, analysts should be able to propose new forms of collaboration, reinforcing the network relationships and the reasons for the actors to remain in the network.

In *Step II.a*, analysts used the "Common goal diagram" to identify dependencies among goals and disclose possible threats to the networked business model. Therefore, analysts should also explore how the chances of collaboration raised in this step can be used to mitigate them. Since some of the relationships in the network may have a sensitive nature, analysts may try to check with the actors to perceive, whether or not, they are interested in establishing future collaborations.

Theoretical background

Step II.b obtains data from BIZ2BIS' steps that were inspired in ANT's guideline of following the actors. These steps enhance the knowledge on the network and provide valuable hints to support the search for mutual interests. *Step II.b* is also influenced by ANT's concepts of problematization and interessement, since it aids analysts to understand if the roles defined for the actors in the networked business model are exploring the potential of future collaborations. The detection of common concerns and their exploitation is also suggested in the literature that addresses the creation of value in network configurations (Normann and Ramírez, 1993, Gulati et al., 2000, Allee, 2008).

5.3.2.3 Step II.c: Negotiation of actor contributions

Phase II is supported by an iterative negotiation mechanism that has as its core *Step II.c*. This step uses the information gathered on the network, its actors, and the conceived arrangements of interests and affinities to analyze critical aims for the networked business model. If need be, *Step II.c* details and confirms detected problems, and considers new proposals for their resolution, which may demand obtaining new data and the readjustment of the proposed solution. Analysts can advance to *Step II.e "Stabilization of value propositions"*, when they obtain indications that the expectations of the actors are met.

Purpose

Step II.c addresses critical aims by detailing the activities that can affect them and the influences that they exert on other aims. It balances gains and efforts of the actors involved in the goal (the ones that support it and the ones that gain from it) to clarify their interests towards that goal. In this step, analysts may have to consider several adjustments to the proposed business model in order to stimulate and encourage actors' participation and avoid betrayals. An iterative search for alternative scenarios should be made until analysts reach a suitable alignment among the interests of the actors and these have reasons to maintain their presence in the business model.

Description and illustration of the artifacts

In the "Negotiation diagram", we placed the goal under analysis (rounded rectangle) and the actor(s) that own(s) it at the centre of the diagram (Figure 29). Below them are the actors that carry out the supporting activities that sustain the central goal achievement. We rated the effort spent on these activities in a scale from $\{1, \ldots, 5\}$ (rectangle adjacent to the activities). Value "1" is the least significant and "5" the most significant. We also used this scale to indicate the gain obtained with the outcomes of these supporting activities, which can have two types of beneficiaries: the central actor(s) that own(s) the goal under study and the set of actors that directly benefit from its achievement (the ones at the top of the diagram). The gains of the former are placed in the red circles, while the ones of the latter are specified below each rectangle labeled "gain", on the right side. To summarize the effort spent and the gain obtained by each actor for the goal under analysis, as well as the difference between both, a small chart is provided in the lower right hand corner of the diagram.

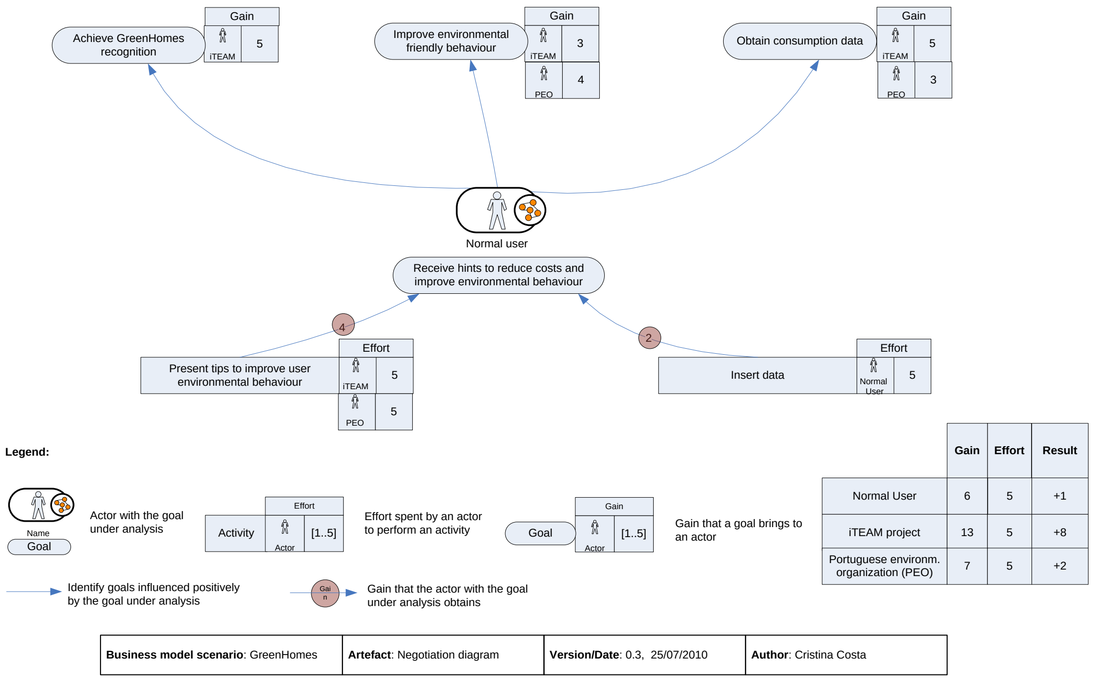


Figure 29: "Negotiation diagram" applied to GreenHomes

The "Negotiation diagram" in Figure 29 details the goal "Receive hints to reduce costs and improve environmental behavior" - a goal owned by the "Standard user" and decisive for the purposes of the GreenHomes business model (as pointed out in *Step II.a*). As we can observe in the upper part of the figure, this goal influences the iTEAM and the Portuguese environmental organization, since these actors depend on its achievement for their own purposes. If these actors suspect that the accomplishment of the aim is at risk, and consequently some of their main interests can be jeopardized, they can abandon the network. In the lower part of the diagram, we have the activities that support the goal under analysis: "Present tips to improve user environmental behavior" and "Insert data". Both demand a high effort from the actors that carry them out. In addition, the latter strongly depends on "Standard users", who have to weekly insert their consumption data. In spite of this, their gain with the achievement of the aim is not significant, as can be seen in the small chart in Figure 29. To complicate matters, "Standard users" do not have other significant benefits in the business model (their gain depends essentially on their effort). Taking into account that the activity "Insert data" can endanger the accomplishment of the goal under analysis, it is necessary to promote actions to strengthen "Standard users" presence, or to minimize collateral damages of their abandonment.

Field use

Analysts should apply *Step II.c* whenever the insights from the "Common goal diagram" reveal actors' goals that may face difficulties in being achieved. Since these goals contribute to the network aims, their implications in the networked business model must be considered in detail. In a first stage, for each of these critical goals, analysts should use the "Negotiation diagram" to represent the scenario that gave rise to suspicions. For each goal and for all actors related with it, analysts should rate the effort spent in executing the activities that support it and the benefits obtained from its accomplishment on the scale $\{1, \ldots, 5\}$. Values can be obtained in two ways: based on the opinions expressed by the actors during the meeting and the interviews, or by questioning them. However, it is advantageous for the approach to persuade the actors with the goal under analysis to give their own assessment of the developed diagram. Their collaboration can promote the earlier identification of problems that may undermine the networked business model (e. g., lack of interest of some actors) and expose misunderstandings.

The sum of the gain and effort for each actor gives clues about their motivation to contribute to the achievement of the goal. If the balance is negative, or residual, and the addressed actors are not able to obtain other benefits to make their involvement worthwhile, analysts should conceive alternatives capable of encouraging participation from these actors. If their balance is clearly positive, they benefit from the goal and analysts can use this insight to support their future options in the study of the business model. After obtaining the balance between the gain and the effort for each actor involved in the critical goal, analysts should compare the obtained results with the suspicions raised in *Step II.a* in order to confirm them, or on the contrary, discard them. Furthermore, the results achieved for each goal cannot be analyzed from a narrow perspective. For instance, a goal may not be appealing for a particular actor due to the few benefits obtained and the high effort demanded, but the business model may offer other advantages that can make it worthwhile for the actor. In situations in which a positive balance is not reached with the business model (it requires a commitment beyond the obtained counterparts for an actor), analysts should initiate a negotiation process. They should try to identify areas of improvement (e.g., fostering collaborations and promoting the sharing of resources). For this to happen, it may be necessary to make adjustments that involve concessions, therefore analysts should try to identify bargaining chips to support their attempt to align the interests of the various actors. *Step II.b "Identification of actor affinities"* can be a valuable source of clues for more collaborative and less penalizing scenarios, which can reduce efforts and maximize benefits in ways to encourage actors to maintain their presence in the network. Whenever analysts consider an alternative scenario based on the knowledge acquitted during the negotiations, they should use a new "Negotiation diagram" to address the goals that may be affected by the changes under consideration. Each updated version of the artifact must be assessed to guarantee the interest of the involved actors.

Analysts should base their attempts to align the interests of the actors, and consequently the stability of the network, on the data gathered in the previous steps of BIZ2BIS. In particular, they should take into account if the individual expectations of the actors (expressed in the “Actors description chart”) are being fulfilled. If this is not the case, analysts should iteratively explore alternatives, negotiate with the actors, and assess the new proposals until the actors that support critical aims to the business model have reasons to maintain their presence in the network.

Theoretical background

Step II.c was mainly inspired by ANT. We followed Latour’s (1986a, p. 267) view that an idea depends on the involved actors, who have the power to appropriate, ignore, modify, or betray it. ANT’s translation influenced us to address the dynamics in networked business models. It showed us the importance of continuously considering the needs of each actor in the network, capturing their interests, convincing them to participate, searching for their alignment, and establishing a program of action. According to our interpretation, translation phases influence, revisit, and overlap themselves, in a continuous process of attempts in which the division in phases sometimes gets lost. Since each translation is triggered by a problem or an opportunity, depending on the characteristics of the scenarios, it is possible to have chains of translations that run sequentially or in parallel. This was observed, for instance, in the implementation of an inter-organizational information system in the port of Barcelona (Rodon et al., 2008). We also integrated this perspective in BIZ2BIS. In *Phase II*, we conceived a negotiation process (with its core in *Step II.c*) that iteratively searches for a business model capable of meeting the expectations of its actors. It is supported by the “Negotiation diagram”, which embraces ANT’s concepts of interessement and enrolment. Based on the data obtained in the remaining steps of BIZ2BIS (that may imply one or more translations), it verifies the interest of the actors in participating in the business model. If situations that jeopardize the network are detected (for instance problematic activities, where actors have to contribute with demanding effort and do not receive significant compensation), necessary adjustments must be made. The solution (based on the insights of the other steps) may require a new translation or involve the return to a previous stage of the same translation. For instance, identify new opportunities, sense possible collaborations, convince others to join the network, and perform adjustments to assure the alignment of interests - a successful negotiation usually requires the accomplishment of mutually satisfying outcomes. The artifact also includes aspects pointed out by business model definitions: it shows the gain and effort of each actor involved in a critical aim and how the actors support its accomplishment (Stähler, 2002).

Kock et al. (1996), inspired among others by Fisher and Ury (1991), propose that the ones responsible for the process should take into account the following guidelines:

- Determine needs, constraints, and resources for all the involved, separating people from the problem, and focusing on interests, not positions;
- Search common needs and desires among the negotiating participants;
- Reinterpret scenarios, or alternatively reframing the problem in creative ways, to benefit all parties.

The symbiosis between BIZ2BIS' steps and the presented guidelines reinforced our choice to use the concept of translation as the main source of inspiration of the conceived negotiation mechanism. The knowledge gathered in *Phase I* and *Step II.a "Detection of dependencies among goals"* allows BIZ2BIS to fulfill the first guideline. The insights obtained in *Step II.b "Identification of actor affinities"* support the second one. *Step II.c "Negotiation of actor contributions"* and *Step II.d "Description of critical dependencies"* aid to expose different sensibilities that may cause drift tendencies. In this case, the approach supports the attempts to better align the interests of the various actors as suggested in the third guideline, so that the resulting network is stable and resilient to pursue the goals set in its business model.

5.3.2.4 Step II.d: Description of critical dependencies

Step II.a "Detection of dependencies among goals" and *Step II.c "Negotiation of actor contributions"* support the identification of actors, activities, and flows, whose absence may put the networked business model at risk. For instance, if some actors do not obtain enough benefits, or if the activities assigned to them are too demanding, the flows to which they give rise may be jeopardized. *Step II.d* details the implications of the lack of these flows. The obtained perception provides analysts with valuable indications that may help them conduct negotiations with the involved actors and mitigate possible threats.

<u>Purpose</u>

When there are indications that business flows may be compromised, *Step II.d* exposes the involved actors and the factors on which they depend on. It also supports the identification of the value propositions harmed by the uncertainty related to these flows.

<u>Description and illustration of the artifacts</u>

The impact of the absence of certain flows in the business model is illustrated by the "Dependency flow diagram" (Figure 30). Similarly to the "Flow diagram", it represents an actor by an ellipse with a labeled image and a business flow by an arrow. Moreover, it lists the factors that can influence the flows under study in a rectangle. In this artifact, labeled ellipses stand for affected value propositions. Dashed arrows connect each of them and the flows under analysis. Their points of origin "X" overlap with the flows under analysis and their destinies point out to the identified value propositions.

The insights obtained in *Step II.c "Negotiation of actor contributions"* (previous section), when analyzing the activity "insert data" and the information flow "consumption data" in the "Negotiation diagram", led us to detail the impact that this flow may have on the business model. As depicted in the "Dependency flow diagram" in Figure 30, the flow "consumption data" can put two important value propositions for the business model at risk: "Obtain data consumption" and "GreenHomes recognition" and jeopardize actors' aspirations.

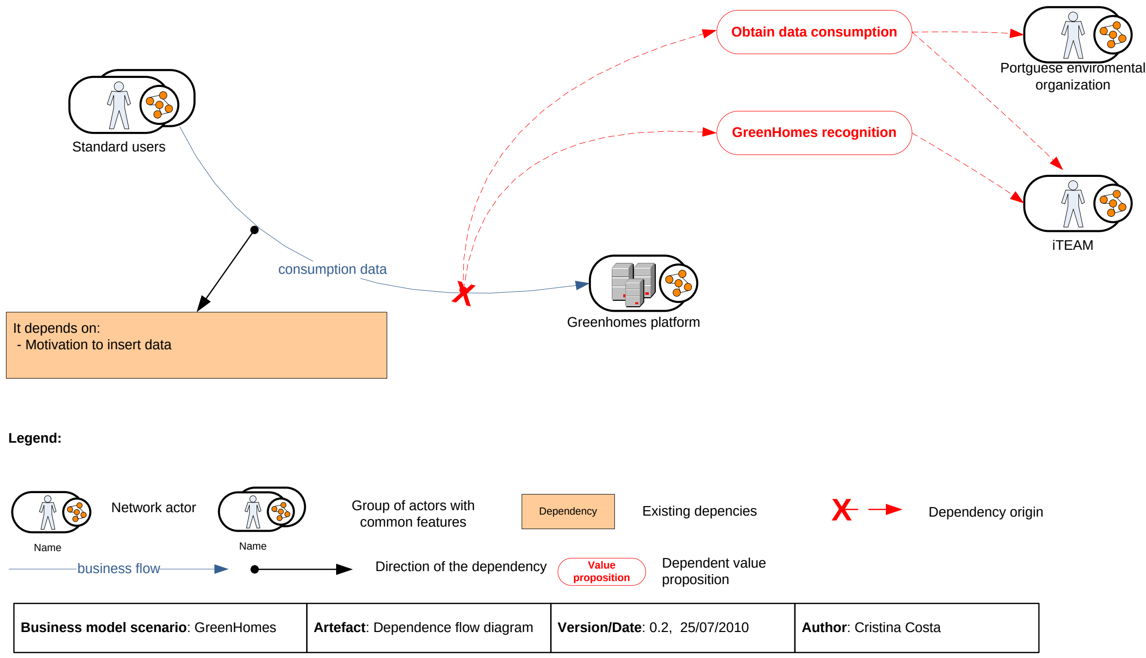


Figure 30: "Dependency flow diagram" applied to GreenHomes

Figure 30 highlights the importance that the consumption data entered by the "Standard users" has for the business model. If no additional incentives are made, in order to motivate and convince them to maintain their participation and manually introduce data, the network will collapse.

Field use

In *Step II.a "Detection of dependencies among goals"* and *Step II.c "Negotiation of actor contributions"*, analysts may detect actors with critical roles, whose participation does not provide enough benefit to compensate their exertion. In such cases, analysts should detail in *Step II.d* the effect of the absence of these actors in the business model. It is critical to identify activities at risk, flows that will cease to exist if these actors abandon the network, activities that depend on them, value propositions that they can compromise, and actors that will see their interests jeopardized. Analysts should use the "Dependency flow diagram" to address the endangered flows (one per diagram, or several, depending on their complexity). They should start by confirming in all the filled in "Actor description charts" the actors' activities that give rise to these flows, as well as their source and target. Then, they should characterize the context of the flows, and try to comprehend their role, importance, and impact on the business model. In this endeavor, analysts should consider the data available in the "Networked business model description chart" (e.g., the fields "Network threats", "Mutual obligations and expectations", "Shared representations and interpretations", and "Existing rules"), discover the factors that may influence the business flows under study, and include them in the "Dependency flow diagram". To end, analysts should consider the goals expressed by the actors in each "Actor description chart", confirm the ones that may be at risk, and extrapolate the value propositions of the business model that can be compromised, as well as the affected actors. The insights obtained with this step disclose situations that can lead to the network collapse. Based on the collected knowledge, analysts should instigate actions to diminish the identified risks, conceive alternative solutions, or make the necessary adjustments.

<u>Theoretical background</u>

The "Dependency flow diagram" was influenced by the relevance assigned to business flows and value propositions in business model theory. These concepts are frequently mentioned in business model definitions, components, and representations (Stähler, 2002, Shafer et al., 2005, Osterwalder, 2004, Bouwman et al., 2008c), as well as in proposals that address networked configurations (Parolini, 1999, Allee, 2008). We were also influenced by ANT's recommendation of following the actors in the network, which led us to detail critical dependencies for the business model. In addition, ANT's concept of translation inspired us to identify threats, in order to consider alternative programs of action able to minimize them and promote the interessement and enrolment of the actors.

5.3.2.5 Step II.e: Stabilization of value propositions

In *Step II.c "Negotiation of actor contributions"*, when indications of events that may jeopardize the business model no longer exist (actors have reasons to participate and their interests are aligned), it is possible to detail the list of value propositions that will be provided by the business model. The actors will evaluate that list in *Phase III*.

<u>Purpose</u>

Step II.e supports the identification of the value propositions made available by the business model. It uses the data gathered in the previous steps of BIZ2BIS to list the existing business flows and based on their contribution to the conceived business model it aids to stabilize the provided value propositions.

<u>Description and illustration of the artifacts</u>

Step II.e is supported by the "Business flows/Value propositions chart". This chart crosses all the flows (first column) with all the value propositions (first row). If a certain flow contributes to, or influences, a given value proposition, the situation is marked by an "X" in their intersection. This artifact, structurally similar to the "Actor/Goals affinity chart", also reveals additional information about the business model. It is possible to become aware of the value propositions that depend on a higher number of flows, as well as on the flows that support more value propositions. For readability, analysts can highlight the flows that contribute to more value propositions and the value propositions that are supported by more flows with a different color. Table 15 illustrates a "Business flows/ Value propositions chart".

Table 15: "Business flows/Value propositions chart" applied to GreenHomes

Business flow/Value proposition chart		Reduce payments and improve environmental friendly behaviour	Greenhomes recognition by the scientific community	Obtain consumption data	Access to user profiles (e.g., address, home typology, home appliances)	Obtain consumption analysis (e.g., averages, typology and region comparisons)	Access to a social network	**Number of relationships**
		V1	V2	V3	V4	V5	V6	
Platform provided services (e.g., environmental tips, communication facilities)	F1	X	X	X	X	X	X	**6**
Consumption data manually inserted	F2	X	X	X		X		**4**
Profile data	F3	X	X		X	X		**4**
Monitored consumption data	F4	X	X	X		X		**4**
Cooperation among actors	F6	X			X		X	**3**
Cooperation between iTEAM project and the environmental organization	F5	X	X					**2**
Cooperation among monitored users and iTEAM	F7			X	X			**2**
Number of relationships		**6**	**5**	**4**	**4**	**4**	**2**	
Business model: GreenHomes		**Version and Date**: 0.3, 25/07/2010				**Author**: Cristina Costa		

In Table 15, the listed business flows were not directly copied from *Phase I*, *Step I.c* ("Flow diagram" and "Flow matrix"). Some of them were grouped because their contributions to the value propositions overlap. For instance, the intangible flows "Cooperation between iTEAM project and the Portuguese environmental organization" and the "Portuguese environmental organization experience" were joined and considered just as one - both address how the association can contribute to GreenHomes. This clustering facilitates the use and understanding of BIZ2BIS when the roles of several flows can be considered one. The network context and the contribution of each flow to the business model support the identification of the provided value propositions. For instance, the value proposition "Obtain consumption data" is made available through the support of the following flows: data obtained (manually and automatically), platform services, and cooperation between the iTEAM project and the "Monitored users". The number of value propositions supported by the same business flow is presented in the last column, and the number of business flows that contribute to each value proposition is shown in the second last row.

Field use

Analysts should employ *Step II.e* when there are no compromising situations for the business model. They should start by considering the list of existing flows based on the data obtained in *Phase I*, *Step I.c "Representation of the business model"* (available in the "Flow diagram" and the "Flow matrix"). Then, they should follow these flows in all the used artifacts to establish how the involved actors interact. *Phase I*, *Step I.b "Description of participating actors"* and its "Actor description chart" are a privileged source of information. It is important that analysts contextualize the flows: activities that support them, network restrictions, interactions, as well as goals and value propositions that the flows may jeopardize. Based on the acquired knowledge, analysts should consider how the flows are brought together and explore their potential by prospecting their assembling possibilities. The arranged combinations enable analysts to make out a draft of the resulting value propositions geared by the aims of the networked business model (identified in *Phase I*, *Step I.a "Exploration of the business model"*, in the artifact "Networked business model description chart"). They should iteratively try to recognize the value propositions that each flow (or group of flows) can support. Whenever a new one is detected, they should add it to the "Business flows/Value propositions chart". A flow that contributes to the accomplishment of a value proposition is marked with an "X" at their intersection. When analysts decide to stop, they should check if the identified value propositions cover all the goals expressed by the network (*Phase I*, *Step I.a*) and its actors (*Phase I*, *Step I.b*). If some of them will not see their interests satisfied, analysts should identify the flows and activities that support the goals not covered and review the proposed solution. Otherwise, they should present the disclosed value propositions to the actors (*Phase III* of our approach).

Theoretical background

Step II.e is supported by two concepts: business flows and value propositions. Both, as mentioned before in this section, are inspired in the business model domain. Furthermore, it integrates ANT's concepts of program of action and inscription, since it establishes the actors' behavior in the network to make the defined value propositions available.

5.3.3 Phase III, Step III.a – Stability assessment

Phase III assesses the idealized business model based on the list of value propositions obtained in *Step II.e* (*Phase II*). We consider that to be "fair", the evaluation must be able to express the actors' views, concerns, and voices. However, it is not always possible to ensure their active and continuous participation in all the aspects covered in *Phase I* and *Phase II*.

Phase III addresses this limitation. Here, BIZ2BIS involves the identified actors in the evaluation of the business model. The scenario under assessment resulted from the application of BIZ2BIS until that moment. It considers the perspectives and expectations expressed by the actors and it reflects the outcome of negotiations to promote the alignment of their interest and the network stability. The iterative refinement provided through *Phase I* and *Phase II* offers a comprehensive view of the resulting business model, the performed options, and the adopted solutions. In order to avoid analysts' bias and possible misunderstandings, actors must reflect on the achieved list of value propositions, confirm if they meet their expectations, and assess the effort and the gain for each. An evaluation performed by the actors themselves (through interviews, or inquiries) ensures that the results obtained represent their own sentiment, and not someone else's perception of their opinion. It also reveals if, in their perspective, the balance of their participation is positive.

It is very useful to the business model study to anticipate possible problems, since they can be a source of negligence, betrayal, and desertion, which can threaten and compromise the network configuration. The perception of the actors improves the analysts' sensibility and ability to discover and tune possible problems before specifying the high-level requirements of the information system that will support the business model. Moreover, if the actors consider that they benefit with their participation, analysts obtain extra evidence of their interest and of their enrolment in the networked business model.

Phase III aims to:

- Get feedback from the actors on the suggested value propositions;
- Identify actors whose balance between obtained gains and performed efforts may lead to their lack of interest and abandonment of the network;
- Promote interventions to perform adjustments on the business model;
- Confirm clues of the enrolment of the actors in the proposed value propositions for the business model.

To address these aims, we conceived one step supported by two artifacts (Table 16).

Table 16: Phase III - Step and supporting artifacts

Phase III – Stability assessment

Step III.a	Evaluation of actors perceptions	**Artifact III.a1**	Interview chart
		Artifact III.a2	Value proposition traceability diagram

5.3.3.1 Step III.a: Evaluation of actors perspectives

Actors evaluate the list of value propositions available at the end of *Phase II* and identify dependencies among them in *Step III.a*. The outcomes of the performed assessment may reveal hints that actors are uninterested or not fully committed to the business model. In this case, analysts must carry out adjustments that may demand the return to BIZ2BIS' *Phase I* (e.g., change the roles of the actors) or to *Phase II* (e.g., initiate a new negotiation). Otherwise, BIZ2BIS should advance to *Phase IV* and proceed with the specification of the high-level requirements of the information system that will support the business model.

Purpose

Step III.a enables actors to evaluate the list of identified value propositions and allows analysts to use the obtained insights to support their decisions. The performed evaluation integrates two different perspectives. One shows the actors' perception of the effort spent to support a certain value proposition, as well as the obtained gain. It compares the gain and the effort of each actor, which provides clues on the benefits that they will obtain with their participation. The other discloses how the actors perceive influences among the value propositions and may expose dependencies not yet detected.

Description and illustration of the artifacts

The "Interview chart" supports the evaluation of the actors. It maps each business model actor (first row) with the identified value propositions (first column). We represent the relationship among actors and value propositions by pairs of integer numbers (g, e), where "g" represents the gain obtained with a value proposition in the range $\{1, \ldots, 5\}$, and "e" denotes the effort performed to support it in the range $\{-5, \ldots, -1\}$. The actors only assign a classification to the value propositions in which they are implicated. If there is no relationship between the actors and the value propositions, the corresponding cells appear empty.

The influences that a specific value proposition has on others is available in its own row, after the pair (g, e), and separated by a "/", such as (g, e)/$[(+|-)(\mathrm{Vi})]^{+}$, where "+|-" further informs whether that same value proposition has a positive ("+") or negative ("-") impact (one must be chosen), towards the value proposition "Vi". The superscript "+" denotes iteration, since a value proposition may influence none, one, or more value propositions. By exposing the pressures/influences among the different value propositions, we have the chance to identify critical actors and value propositions, anticipating any "domino effects". For instance, if an actor that supports several value propositions decides to abandon the business model, others that rely on them may reconsider their participation for having their gains compromised.

Table 17 exemplifies the "Interview chart" for the actor "Standard user". For example, it shows that this actor assigns an effort of "5" to support V3 "Obtain consumption data" and then gives an importance of "1" to the benefits obtained from it. The "Standard user" considers the manual insertion of data highly demanding and does not see many advantages in maintaining a record of its consumption. This actor only assigns a gain greater than "3" to V1 "Reduce payments and improve environmental friendly behavior", which indicates only a few attractive counterparts. Taking into account all the value propositions, the balance between gain and effort for this actor is slightly positive. This reinforces the idea, obtained from the above steps, that additional value propositions must be created to maintain the interest of this actor in the network. The data filled in Table 17 also shows that the effort spent by the "Standard user" is strongly connected with data introduction and that several value propositions depend on this data. For example, the "Standard user" role concerning value proposition V3, positively affects value propositions V1 and V5. If this actor decides to quit the business model, the gains other actors get from V1 and V5 would be affected.

Table 17: Interview chart used in GreenHomes

		Actors
Value propositions		**Standard user**
Reduce payments and improve environmental friendly behavior	**V1**	(+5,-1)
GreenHomes recognition by the scientific community	**V2**	
Obtain consumption data	**V3**	(+1,-5)/+V1,+V5
Access to user profiles (e.g., address, home typology, home appliances)	**V4**	(-2) /+V1,+V5
Obtain consumption analysis (e.g., averages, typology and region comparisons)	**V5**	(+3)/+V1, +V6
Access to a social network	**V6**	(+2,-1)
Date: 30/07/2010	**Sum**	(+11,-9)

To relate the different concepts used in BIZ2BIS and expose dependencies among them, we developed the "Value proposition traceability diagram" (Figure 31). Its compact representation traces the flows, activities, and actors that may influence a particular value proposition, as well as other value propositions that have an impact or that rely on it. Based on the data filled in by the actors in the "Interview chart", the "Value proposition traceability diagram" uses labeled arrows to emphasize dependencies among value propositions (the lilac circles): the plus sign means that one value proposition influences other(s) positively, while the minus implies a negative influence. For instance, V3 "Obtain consumption data" positively influences V1 "Reduce payments and improve environmental friendly behavior" along with V5 "Obtain consumption data analysis". This chart also uses the filled in pairs of gain and effort to represent the interest that a given actor has on a certain value proposition: if the actor receives more than it gives, the artifact will indicate fulfillment by using an arrow with a plus sign to connect both; when the effort is superior, it employs a minus sign demonstrating dissatisfaction. We only present the evaluation for the actor “Standard user”, since it is the one for whom we show information in the “Interview chart” (Table 17).

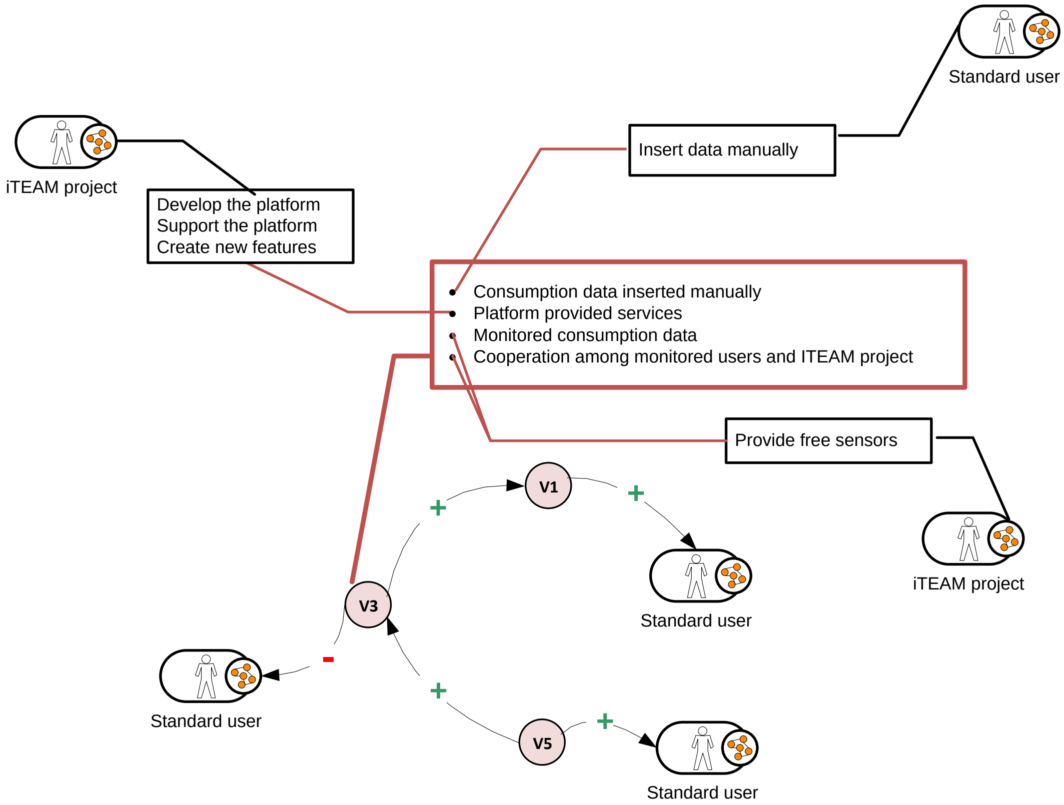


Figure 31: “Value proposition traceability diagram” applied to GreenHomes

The potential of the “Value proposition traceability diagram” goes beyond an alternative representation of the information available on the “Interview chart”. It connects and relates information collected in several artifacts, providing an interesting broad vision of the dependencies among value propositions, as well as of the factors that can constrain or potentiate them. To reach this aim, starting from the value propositions and by looking backwards in the insights obtained in BIZ2BIS’ *Phase I* and *Phase II*, we gradually show: 1 - The combination of business model flows that support a given value proposition (the lilac rectangle linked to V3); 2 - The list of activities that give rise to each flow (e.g., the activity “Insert data manually” provides the means so that the flow “Consumption data inserted manually” can be obtained); and 3 - The actors that carry out each activity (e.g., the “Standard user” performs the activity “Insert data manually”). The representation in just one artifact of all the described relationships enables analysts to identify in a prompt manner the actors that stand to provide the pillars of the value proposition. Furthermore, it allows them to confront this information with the gains and the efforts of their role in the network.

<u>Field use</u>

Analysts should list the identified value propositions (available in “Business Flows/Value propositions chart”, *Step II.e*), as well as the actors related to them (detailed in the “Actor description charts”, *Step I.b*) in the “Interview chart”. Next, analysts should ask the actors to fill in the resulting “Interview chart” and explain how they should indicate for each value proposition the gain obtained with it, the effort to support it, and its dependencies with other value propositions. Analysts should be available to clarify any question that may arise. To complement the gathered data, they should also check if the identified value propositions are in accordance with the view of the actors for the business model, obtain their opinion about the ones that affect their goals, and verify if any are at fault. To be able to obtain this less obvious or more delicate information, we recommend that analysts obtain the responses of the actors in person. Taking into account that most of them are unavailable to perform assessments regularly and can lose confidence in BIZ2BIS if they are obliged to perform several evaluations, analysts should carefully manage these requests.

The “Interview chart” provides clues about potential problems. To detect them, we suggest three procedures:

1. Verify, for each actor, if the balance between the gains and the efforts is positive. Actors having negative results are potential candidates in abandoning the networked business model.
2. Use the information provided by the “Interview chart” to recheck if the value propositions that each actor addresses are in line with the goals they expressed in *Phase I*. The results can confirm, or contradict, the positive indications already obtained in *Step II.e “Stabilization of value propositions”*. Not considering vital aims of the actors can put the network at risk.
3. Ensure that problematic dependencies between value propositions have viable alternatives. To achieve this, analysts should assess extreme hypothetical events (e.g., the abandonment of key actors, the existence of irreplaceable value propositions, or the restrict access to indispensable resources). They should use the obtained insights in their attempts to foresee possible consequences and avoid future anti-programs.

To facilitate the application of the three procedures above, analysts can use alternative representations of the data obtained in the “Interview chart”. For instance, they can use graphics to improve the readability of the gathered information and support their analysis. Analysts can show, for example: 1 - The gain obtained and the effort spent in all value propositions for each actor; 2 - The actors involved in each value proposition; 3 - Actors with higher/lower gains and efforts; and 4 - Value propositions that require more exertion from the actors. Analysts can also use the compact visualization of dependencies depicted in the “Value proposition traceability diagram” (Figure 31) to detect critical value propositions for the business model. They can visualize factors that can constrain or potentiate them, such as business flows, activities that gave rise to the flows, and the actors that performed them. The described relationships help analysts to disclose vital actors for the business model and confront these insights with the reached gain and the performed exertion.

When applying the three procedures, analysts should give special attention to actors with major influence in the network, like those who invest considerable time and money, those that hold key resources or capabilities, those with a high degree of influence, those that connect sub-domains (e.g., an actor who works in two distinct networks), or those that cannot be replaced. It is essential to assure that their demands are satisfied, or that viable alternatives are discovered.

In cases where it is not easy to perceive the relevance of an actor for the network, we advise analysts to resort to two concepts borrowed from Social Network Analysis (SNA): centrality and prestige. SNA uses them to determine the prominence or importance of the actors in a social network. From the indices available for measuring centrality and prestige, we chose the degree of a node for its potential to disclose if an actor maintains numerous contacts with other network actors or if an actor enjoys high popularity. Furthermore, it can be easily applied, even for users with no mathematical skills. For directional relationships the degree centrality focuses on the actors as senders, while the degree prestige as recipients (Wasserman and Faust, 2008):

- Degree centrality – covers the actors' out-degree (number of interactions with origin in the actors). The actors with higher out-degree are often said to be powerful or influential in the network, since they are able to interact with many others and transmit their own perspectives. They have greater opportunities because they have alternatives and they can place less reliance on specific actors. The limitation of this concept is that it only takes into account the immediate ties than an actor has, rather than indirect ones.

- Degree prestige – covers the actors' in-degree (the number of interactions terminating at the actor). The idea is that actors who are prestigious tend to receive many nominations or choices.

The two concepts above must be checked, in particular, for actors that are not pleased with the return that they get. In these cases, it is critical to understand their impact on the networked business model to perceive if they can compromise it.

<u>Theoretical background</u>

The concept of translation, particularly enrolment, showed us the importance of understanding the commitment of the actors towards the designed business model. If they do not accept the roles defined for them, their enrolment is compromised. In the attempt to understand how to avoid a network collapse, we perceived it was fundamental to get the actors feedback and understand if their expectations were being met. Therefore, we decided to encourage their collaboration and involve them in the business model appraisal. We handed over the "Interview chart" with the list of value propositions to the actors who were interested parties so that they could perform their own evaluation and avoid the bias of researchers.

The need to assess the business model gave rise to the development of the “Interview chart”. This artifact intersects all the participating actors with the available value propositions and enables the former to evaluate the latter in terms of gain and effort. The range of the answers was inspired by the Likert scale (Likert, 1932), since its characteristics contribute in capturing the actors’ interests in the business model.

Likert scale “provides a range of responses to a given question or statement” (Cohen et al., 2011, p. 386). It is built in a degree of sensitivity and differentiation of response that renders it a very attractive and widely used instrument (Cohen et al., 2011). Due to its ability for tapping attitudes, perceptions, and opinions, we used it in BIZ2BIS to capture the perception of the actors towards the conceived business model. However, when using the Likert scale problems may arise. For instance, interpretation issues, since numbers in a scale have different meanings for different respondents (one person “4” may be another’s “5”). Its use also makes it impossible to know if the respondents wish to add any other comments about the issue under investigation. When evaluating the business model in BIZ2BIS, the latter two problems are minimized. Even if what holds true for an actor differs from others, it is critical for our proposal to get the actors own viewpoints, since false consensus can compromise the assessment and put the business model at risk. BIZ2BIS highly values individual perceptions. Therefore, when detailing the benefits of the participation for an actor, it does not use values assigned by other actors. In addition, its negotiation mechanism encourages the actors to express their opinion and promotes the iterative refinement according to their expectations. Although studies are not conclusive on the best scale to use, we decided to use a three-point scale in one of our cases to fill in the “Interview chart” in an initial stage of our research to facilitate choices and decisions. However, even for us (external entities have a lower perception of the business model context) this scale seemed extremely reductive. Thus, we started to use a five-point scale where the anchors range from 1 (“strongly disagree”) up to 5 (“strongly agree”) and tested it in other cases. The scale lived up to the expectations and there were no negative reactions. A five-point is widely used, people easily recognize and apply it, and there are actually many studies in business model research that rely on it, for instance (Aziz et al., 2008, Laumer et al., 2008). Therefore, we decided to adopt it. Since we do not have a real mid-point (a category that will allow actors not to adopt a stance), we opted in using an odd number scaling in our research. The scale does not have a negative and a positive pole; it proposes an evaluation that goes from very little to very great.

In usual circumstances, actors will not abandon the network if their gain for participating is superior to their effort. On the contrary, a negative balance can encourage actors to abandon the network, which in some cases lead to its collapse. To prevent undesirable departures, analysts must iteratively search for alternative business model scenarios. We consider that a stable business model is reached if the balance between the gain and the effort of the actors is positive, according to their own evaluation parameters. In a proposal in which all the actors achieve a positive balance and agree with the proposed suggestions, analysts have reached a solution that offers good indications on the stability of the networked business model.

We note that some actors can gain more than others with their participation in the business model. However, this notion of gain is particularly tricky as it is very subjective. Usually, in the business model domain, the revenue model is closely related to the obtained gains and its results have direct implications on the business model viability. In BIZ2BIS, our assessment goes beyond financial issues. We consider several types of flows (e.g., material and services, financial, information, and intangible), as well as their context. However, when evaluating a business model, something that can be extremely valuable to an actor, may not appeal to another. For instance, the discovery of a vaccine for malaria is more cherished in regions of the globe that have to fight this disease. Moreover, the financial value assigned to a product or service is very volatile (what was established when conceiving the business model may not be valid a month later). The influence of intangible flows (e.g., prestige and brand loyalty) on business model is also difficult to quantify financially. Therefore, we focused BIZ2BIS' evaluation on each actor and on their individual perceptions. In such an assessment, we considered crucial to establish the goals that each actor believes to be essential to participate in the business model and assure their satisfaction.

In our first attempts to evaluate business models, we started by exploring other alternatives that could help us detect if we had reached a stable solution. At the time, we did not focus on the actor, but on the network. Our aim was to apply techniques already established in other fields in order to analyze network configurations. We intended to use the information obtained in the previous phases of BIZ2BIS (in particular, actors' gain and effort, and their interactions) as input data for those techniques. With this purpose, we explored how we could use the potential of Game Theory (Myerson, 1997) and SNA (Wasserman and Faust, 2008) in BIZ2BIS.

Game Theory aims to mathematically model conflict and cooperation between intelligent and rational decision-makers (Myerson, 1997, Osborne, 2003) that encompass a set of strategies available to those players (Kelly, 2003). It "provides general mathematical techniques for analyzing situations in which two or more individuals make decisions that will influence one another's welfare" (Myerson, 1997, p. 1). Taken into account Game Theory scope, we hoped to find some clues that could help us understand if we were in the presence of stable networks, in which its actors were aligned around the carried out decisions. Game theorists study quantitative models and hypothetical examples, posing questions in the context of a simplified model. For any rational decision-maker, researchers search for some way of assigning utility numbers to different outcomes that they care about, aiming at maximizing decision-makers' pay-off. For many decision-makers the expected utility may be a nonlinear function (Kelly, 2003). Considering that all games are subjected to some simplifying assumption before they can be modeled – if the theorists use wrong assumptions, they will create perfect solutions to the wrong problems (Harford, 2006).

When evaluating networked business models this fact gains an extra importance due to the inherent complexity of their contexts. It is tremendously difficulty to model people's interests, indecisions, and fears in an accurate manner, as well as to take into account the potential choices and pay-offs of others in these scenarios. In addition, Game Theory considers that players act rationally, in their self-interest, understand the impact of their actions on others, and consider the reactions of others. In fact, irrational choices can be made and many players have difficulties in perceiving their scenarios let alone those of others. The uncertainty involving networked business models, the difficult in representing realistically the intricacies of their social interactions, and BIZ2BIS'aim in sharing a common language between analysts and practitioners led us to abandon this research direction. In alternative, we drew our attention to SNA studies.

SNA and our approach share common features: it addresses actors and their actions, takes into account relational ties between them (either tangible or not), and views the network structural environment as providing opportunities for, or constraints on, individual actions (Wasserman and Faust, 2008). Its concepts of centrality and prestige can be a useful contribution to identify actors with privileged positions in the network. Furthermore, it provides the concept of structural balance, which considers balance for graphs and directed graphs separately. However, to apply it, the network ties must possess a sign or a valence (expressing either positive and negative attitudes or sentiments). This implies that relationships, such as "collaborates with" and "interacts with", which are not signed and thus have no obvious dual, cannot be studied (Ibid., p. 223). This is a serious limitation since those interactions are frequent in business model scenarios and can be quite stable in certain institutional, economical, environmental, and political constraints (e.g., scientific research groups). Even in signed relations, it is complex to calculate stability indicators of networked business models by using the SNA concept of structural balance.

Mathematical models are a simplification of an extremely complex reality and of difficult application to business model scenarios. While Game Theory and SNA ensure that a result follows logically from a model, they cannot assure that the result itself represents reality. Furthermore, in BIZ2BIS, all the information obtained on the network and its relationships is based on the common sense and experience of each actor (whose perception might change according to their interests and knowledge), compromising the validity of formal methods based on their data. Therefore, we decided to abandon the idea of using mathematical models already established in other fields and decided to focus our attention on capturing the perspective of each actor. For this to happen, it was fundamental to share a common language with practitioners to understand their viewpoints - it will be them that will influence and establish patterns of behavior in the network. Therefore, we created an easy to use artifact (the "Interview chart") to support the evaluation of the available proposals and the analysis of its insights. This artifact promotes discussion among analysts and practitioners, gathers the information already obtained in the previous phases of BIZ2BIS, encourages the identification of problems, and supports their resolution.

5.3.4 *Phase IV, Step IV. a- Information system specification*

The insights gathered in the first three phases of BIZ2BIS enable analysts to detail the actors' roles, their interactions, performed activities, and value propositions. However, our goal is beyond the discussion, design, and evaluation of business models. Therefore, in *Phase IV*, we used the input from the previous phases to provide indications on how to elicit the high-level requirements that ultimately should be met by an information system that supports the business model. To enable this translation of knowledge, we used the concept of service (Marks and Bell, 2006), which establishes a point of contact between what organizations provide to their customers or partners, and the functionalities delivered via the interface of an information system. *Phase IV* helps analysts to identify the services provided by networked business models. Furthermore, it supports the collection of relevant information on each service and details how they should be supported by the underlying information system according to the solutions adopted for the business model. At the end of this phase, the documentation produced by the analysts when applying BIZ2BIS should be delivered to the ones responsible for the information system deployment.

Phase IV aims to:

- Identify the services to be provided by the information system;
- Specify the high-level requirements of the underlying information system.

Phase IV achieves this with one step supported by one artifact (Table 18).

Table 18: Phase IV – Step and supporting artifact

Phase IV – Information system specification

Step IV.a	Consolidation and description of requirements	**Artifact IV.a1**	Service specification chart

5.3.4.1 Step IV.a: Consolidation and description of requirements

When the actors express a positive balance between the values of gain and effort for their participation in *Phase III "Stability assessment"*, they acknowledge their agreement with the proposed solution. Based on their responses, analysts then use the data gathered on the business model to recheck if the expectations of the actors are being fulfilled. When these conditions are met, analysts should advance to *Phase IV*, *Step IV.a*, and specify the high-level requirements of the information system underlying the business model. Throughout this step, discussions with the actors to clarify possible doubts may expose new data that may demand the return to *Phase III* (e.g., additional information about a value proposition) or to *Phase II* (e.g., a new business model flow) in order to make adjustments. At the end of *Step IV.a*, analysts should deliver the developed specification to the team responsible for the deployment of the information system.

Purpose

Step IV.a guides analysts in the specification of the high-level requirements of the information system that supports the business model. It establishes a bridge between the latter two by using the data obtained in the first three phases of BIZ2BIS to identify and detail the services to be provided by the information system.

Description and illustration of the artifacts

Analysts use the "Service specification chart" to detail the services to be provided by the supporting information system. Each artifact consists of a set of fields that should be filled in for each service based on the information obtained in *Phase I*, *Phase II*, and *Phase III*. Below, we present the fields used to catalog each identified service:

- Name/identifier: presents the service name and its identification number;
- Version: identifies the service version, its data, and author;
- Goal: succinctly describes the aim of the service;
- Description: describes the activities performed when using the service;
- Actor that provides the service: identifies the actor(s) that provide(s) the service;
- Actor that uses the service: identifies the actor(s) that use(s) the service;
- Input data and their source: depicts input information flows, as well as their source;
- Output data and their target: describes output information flows and their target;
- Service dependencies: identifies supporting services;
- Access control mechanisms: describes the service permissions and access rights;
- Business flows leading to the service: identifies the business flow(s) that contributed to the service detection;
- Reasons for its existence: explains the motives behind the service creation;
- Service restrictions: presents the rules employed by the service in its activities;
- Information system support: describes how the service is supported by the information system;
- Remarks: provides additional comments about the service.

Table 19 exemplifies the "Service specification chart" for the service "User authentication" that enables GreenHomes' users to access the platform applications by providing their credentials (such as login and password). The information gathered in *Phase I*, *Phase II*, and *Phase III* on the service is summarized in the artifact. Analysts and development teams (or deployment) can easily perceive the actors that interact with the service, how they do it, the reasons for the service existence, the involved business flows, the activities related to the service, rules that govern its operation, and how the information system should made it available.

Table 19: Service specification chart applied to GreenHomes

GreenHomes	Service specification	
Name/identifier	User authentication	Id: **1**
Version	Number V0.2, date: 30th of July, 2010, author: Cristina Costa	
Goal	Provide access to GreenHomes applications	
Description	The user, after signing in, can access the platform applications through this service according to his/her profile	
Actor that provides the service	GreenHomes information system	
Actor that uses the service	Standard user, Monitored user, iTEAM project, and the Portuguese environmental organization	
Input data and their source	Login *Password* The Information is inserted by the users	
Output data and its target	No output data	
Service dependencies	User registration	
Access control mechanisms	Non existent	
Business flows leading to the service	Profile data Consumption data Platform environmental features	
Reasons for its existence	Assure that only registered users have access to the platform and provide information (according to the users' profile)	
Service restrictions	Monitored users must have a protocol with the iTEAM project It is mandatory to fill in all the required fields	
Information system support	The information system must have a password encryption mechanism When a user signs in, his/her profile is checked to identify the functionalities assigned to that user	
Remarks	No remarks	

<u>Field use</u>

Analysts should start by identifying the services to be supported by the information system. To this end, they should consider the ones that must be provided to make the value propositions acknowledged by the available actors (in *Phase II*, *Step II.e*, "Business flows/ Value propositions chart"). We note that each value proposition can give rise to one service, or influence more than one, depending on its complexity. Conversely, several value propositions can also be at the origin of just one service. The partition or joining of value propositions into services must be assessed for each case, based on the dependencies detected among value propositions, the context of the business model, and the needs of its actors. To obtain this information, analysts should trace back the factors that conducted the business model towards the acknowledged value propositions in BIZ2BIS (*Phase I*, *Phase II*, and *Phase III*) and use the obtained data to detail the identified services.

Analysts should use one "Service specification chart" to detail each service. After filling in the data that identifies it ("Name/identifier" and "Version"), they should start to specify the service's "Goal", "Description", "Service dependencies", and "Business flows leading to the service" based on the established value propositions (*Phase II*, *Step II.e*, ,"Business flows/Value propositions chart"). When filling these fields, they must also consider the flows that support the value propositions (intersections in "Business flows/Value propositions chart"), in particular, the information and service flows supported by technologies. The former type offers clues about the data used in the interaction among the actors and the information system services that must be available, while the latter supply indications about the accessed services and upon who uses them. The insights obtained on business flows (*Phase I*, *Step I.b*, "Actor description chart") also help analysts detail the fields: "Actor that provides the service", "Actor that uses the service", "Input data and their source", and "Output data and its target". To better understand the business flows and their implications on the service, analysts should also take into account the activities performed by the actors that support and use it (detailed in each actors "Actor description chart"). Analysts should also include the topics disclosed about the network (available in *Phase I*, *Step I.a*, "Networked business model description chart") in the specification of the service, since they clarify rules that govern the service use (e.g., the fields "Mutual obligations and expectations", "Shared interpretations and representations", and "Existing rules"). Figure 32 illustrates the phases, steps, and artifacts that support the filling in of the fields (the green vertical straight line represents the scope of each influence). All the information obtained on each service provides analysts with the necessary background to indicate in the field "Information system support" how the service should be made available. After specifying all the services, analysts should deliver the documentation that resulted from the use of BIZ2BIS to the development (or deployment) team.

Scenario under study	**Service specification**
Name/identifier	User authentication
Version	Number V0.2, date: 30th of July, 2010, author: Cristina Costa
Goal	Provide access to GreenHomes applications
Description	The user, after signing in, can access the platform applications through this service according to his/her profile
Actor that provides the service	GreenHomes information system
Actor that uses the service	Standard user, Monitored user, iTEAM project, and Portuguese environmental organization
Input data and their source	Login, *Password* The Information is inserted by the users
Output data and its target	No output data
Service dependencies	User registration
Access control mechanisms	Non existent
Business flows leading to the service	Profile data Consumption data Platform environmental features
Reasons for its existence	Assure that only registered users have access to th provide information (according to the users' profi
Service restrictions	Monitored users must have a protocol with the iT It is mandatory to fill in all the required fields
Information system support	The information system must have a password encryption mechanism When a user signs in, his/her profile is checked to identify the functionalities assigned to that user
Remarks	No remarks

Phase II, Step II.e, ***"Business flows/ Value propositions chart"***

Phase I, Step I.b, ***"Actor description chart"*** *Phase I, Step I.c,* ***"Flow diagram"*** *Phase I, Step I.c,* ***"Flow matrix"***

Phase III, Step I.a, ***"Value proposition traceability diagram"***

Phase I, Step I.a, ***"Networked business model description chart"***

Phase II, Step II.e, ***"Business flows/ Value propositions chart"*** *Phase I, Step I.c,* ***"Flow diagram"*** *Phase I, Step I.c,* ***"Flow matrix"***

Phase I, Step I.a, ***"Networked business model description chart"*** *Phase I, Step I.b,* ***"Actor description chart***

Figure 32: Contributions from *Phase I*, *Phase II*, and *Phase I* to the "Service specification chart"

<u>Theoretical background</u>

Information systems projects often fail (Carbone, 2004). For instance, according to regular reports between the mid-1990s and the mid 2000s, around two thirds of large projects in the United States failed to meet budget and schedule goals, or lacked critical requirements (Graham, 2008). These failures can be caused by poor project management and technical factors, but also by social and organizational issues (Doherty and King, 1998, Schmidt et al., 2001). Like others (Mumford, 1983, Holmström and Robey, 2005), we believe that information systems development is a socio-technical process. Under this perspective, no project is purely technical or purely social. For this reason, information systems should not be regarded solely as technical artifacts composed of hardware and software, but as social systems enabled by technology (Lewis and Townson, 2004).

Several researchers have sustained that information systems, and technology in general, are not independent from the network where they are applied. For example, Walsham and Sahay (1999) studied the development and the use of a geographical information system to improve land management in selected districts in India. Their study shows that when the technology was transferred to India, the implicit western cultural assumptions inscribed in the adopted solution (maps, spatially related data, or overlays) became problematic. An alignment among the Western developers and the locals was never reached and five years after the start of the project, none of the systems were in real working use at district level. Social and technical stability resides in the mutual dependency between technological features and the social context (Holmström and Robey, 2005). This fact is particularly critical and assumes an extra relevance in the complex interconnected worlds where networked business models operate. To answer this challenge in BIZ2BIS, we used ANT's guidelines to address the role of non-human actors, such as information systems, and look at their interactions in the networked business model. ANT inspired us to integrate topics that allow us to complement the requirements of the business model with the specificities of its context and technical considerations. Together, these perspectives create a valuable source of knowledge that supports the specification of the high-level requirements of the information system underlying the business model.

We noticed that BIZ2BIS and the Zachman Framework (Zachman, 1987) share common viewpoints. This framework consists of a two dimensional classification matrix. It has six primitive interrogatives as columns: "Data (what)", "Function (how)", "Location (where)", "Time (when)", "Stakeholder (who)", and "Motivation (why)" and an enterprise's views as rows. Its first three rows, respectively "Scope (contextual)/planner's view", "Enterprise model (conceptual)/owner's view", and "System model (logical)/designer's view" when intersected with the columns cover aspects such as business goals, high-level data, stakeholders' interactions, policies, standards, roles, responsibilities, performed activities, or information needs. These topics provide a view of an enterprise that possesses many aspects in common with our characterization of the business model. The following two rows ("Technology model/ builder's view" and "Detailed representations/subcontractor's view") of Zachman Framework describe how the needs identified can be implemented. This connection strengths BIZ2BIS' potential to bridge the gap between business models and their supporting information systems, while specifying the high-level requirements of the latter.

We resorted to the concept of service to translate the insights obtained in the first three phases of BIZ2BIS into high-level requirements that ultimately should be met by the underlying information system (Marks and Bell, 2006). A service is defined as a unit of functionality that represents available value propositions in a particular environment (Lankhorst, 2005). The concept is the result of a separation between its "external" and "internal" behavior: externally, it should be self-contained and have a clear purpose, while internally it addresses details of its execution. This latter information is irrelevant for the service consumers (Lankhorst, 2005). Using this concept in BIZ2BIS offered us a decisive flexibility in business and information technology design and a common language for the professionals of these areas (Lankhorst, 2005). It enabled us to establish a bridge between the value propositions of the business model and the internal business processes implemented by the actors, as well as their underlying information system. The result is a network of connected services – a blueprint of how a network of organizations creates and delivers value.

5.4 Conclusions

We described how BIZ2BIS enables the discussion, design, and evaluation of networked business models, as well as the identification of the high-level requirements of their supporting information systems. We detailed the four phases of our approach by addressing their purpose, supporting artifacts, field use, and theoretical background. The first phase identifies and characterizes the network's actors, as well as the structural aspects that influence their behavior. The second suggests eventual adjustments to ensure the alignment of the actors' interests through an iterative negotiation. The third evaluates the business model viability. Finally, the fourth specifies the high-level requirements of the underlying information system. To conceive BIZ2BIS, we reviewed the literature on business models, which enabled us to disclose topics to address in their study. Furthermore, it underlined the importance of taking into account their socio-technical nature. To consider this perspective, we grounded our approach on the tenets of Actor-Network Theory (ANT), Structuration Theory, and Social Capital. However, BIZ2BIS' users do not need to be familiar with their concepts, which are embedded in its phases.

BIZ2BIS guides the search towards stable networked business models. It gathers data on the network, its context, and its actors to clarify and expose their different opinions, preferences, and instincts. By providing a common language between analysts and practitioners, the approach encourages the collaboration of the latter and promotes communication and discussion among all the involved. It contributes by transforming the debate from a battle of wills, into a thorough analysis that takes into account their perceptions, alternative solutions, and puts the network stability above individual interests. Its insights support the actors with the power to make decisions to carry out adjustments, which is particularly advantageous when threats to the business model are identified. Moreover, BIZ2BIS overcomes the gap between business models and the development of their information systems. It uses the business model analysis outcome to systematically specify the high-level requirements of their underlying information system in a business model driven way.

In the following chapter, we will present the roadmap to the BIZ2BIS proposal, by discussing the contributions it received from the three case studies: HowMuchIsIt, Online Journal, and GreenHomes, as well as from the InovWine action research project.

Chapter 6

The roadmap to the BIZ2BIS proposal

6.1 Introduction

In the previous chapter, we presented the final version of BIZ2BIS from the perspective of the user. Its foundations stem from a thorough literature review (detailed in Chapter 2 and Chapter 3), which allowed us to develop an initial draft that has been incrementally improved during our research. In this chapter, we will discuss how the proposal evolved, namely the contributions it received from the three case studies (HowMuchIsIt, Online Journal, and GreenHomes) and from an action research project (InovWine). The first case study enclosed a portal-supported mediation business for the acquisition of technological equipment. It enabled retailers to advertise their products online, and acted as a shop-window for customers (whether individuals or companies). The second addressed the development of an online portal for a Portuguese Scientific Association that decided to publish its journal online. In addition, it also involved the scrutiny of a suitable business model for the submission of articles, reviews, and their publication. The third dealt with the development of a platform to collect data about users' electricity consumption per household, every week. In return, the platform would monitor the obtained data and provide advice on how to enhance the ecological footprint of its users, as well as tips to reduce their electrical bill. These case studies enabled us to test and improve BIZ2BIS. They allowed us to detect and weed out any glaring omissions or misfits, before moving on to an action research project where the approach would be used to intervene and drive decisions affecting multiple stakeholders. This was InovWine, which aims to use technology to increase the overall competitiveness of the wine sector through the development of new products and services in the Portuguese region of Bairrada. The density of its social context, the entanglement of its interactions, and the distinct interests involved, allowed us to scrutinize the ability of BIZ2BIS to address networked business models. We had the chance to work in close collaboration with practitioners, intervene to solve a complex problem, contribute with indications to achieve a more suitable business model, and specify the high-level requirements of its underlying information system. In fact, InovWine was our main source of inputs. It contributed to consolidate BIZ2BIS and its valuable insights molded the final version of the approach.

The remainder of the chapter is organized as follows: in section 6.2, we detail what we learned from each case study to improve BIZ2BIS. Then, in section 6.3, we discuss the contribution of an action research project to our approach. Next, in section 6.4, we present a retrospective look towards BIZ2BIS evolution. The last section draws conclusions from the study.

At the end of the chapter, the reader should be able to:

1. Understand how three case studies and an action research project contributed to the evolution of BIZ2BIS.

6.2 Contribution of three case studies to BIZ2BIS

The three case studies introduced in Chapter 4 enabled us to extract some insights to refine BIZ2BIS. In this section, we start by presenting each case context. After that, we justify the reasons for their study, their potential limitations, and describe how we applied the approach to each of them. We also underline the obtained outcomes according to two perspectives: topics of interests to the participating actors and issues to consider in the improvement of the approach. Our summary lets us present a snapshot of BIZ2BIS prior to its application to the InovWine project and provides the reader with a trace of how the approach evolved. The detail and thoroughness of the description may be sacrificed (to some extent) to discuss the obtained achievements, compare and contrast the case studies, and thereby look for emergent topics to refine.

6.2.1 Case one: HowMuchIsIt

A company with its head-office in Portugal developed HowMuchIsIt, a portal-supported mediation business for the acquisition of technological equipment. It allowed retailers to advertise their products online, and acted as a shop-window for customers (individuals or companies) to search and compare products, their specifications, prices, stocks, and delivery times across vendors. Since the prices presented at the portal were mere estimates, the clients could, if interested, request a precise quote from the retailers that they considered more appealing. The portal mediated this procedure, because it kept the identities of the buyer and seller concealed from each other.

Clients placing orders over 2500 euros were offered free technical consulting in the selection of products and preparation of their request for proposals. These were sent to the retailers selected by the customers, who then entered a reverse auction. Each bidder had no knowledge of their competitors’ conditions. To ensure that the clients did not influence the retailers through external negotiations, the company that developed the portal would only reveal the supplier’s identity of the winning proposal after the selection. To complete the transaction the client had to contact the chosen vendor to close the deal.

When the company started the business, no fees were charged to retailers advertising their products in the portal. The goal was to get enough content so that customers could discover the advantages of using it as a mediator in their purchases. Nevertheless, the aim was to charge the vendors at a later stage. The company board believed that the competitive advantages provided by their portal justified the payment of annuities: retailers, who could not afford a standalone e-business platform, obtained the chance to compete in a global market; the ones which already had a web site, would benefit from an extra vehicle to promote their products, analyze their direct competitors, and increase their sales. However, since retailers' margins in the electronics market were (and are) usually low, the fees could significantly erode their profits, reducing the attractiveness of the portal. To counter this threat, the company that created and promoted HowMuchIsIt negotiated agreements with two major wholesalers, who offered special conditions to the retailers doing business through the portal.

6.2.1.1 Reasons for the study

In spite of a promising start, the portal began to experience difficulties in attracting the required number of retailers to ensure the viability of the business model. In view of this scenario, the company that idealized and developed the portal thought it would be interesting to analyze the HowMuchIsIt's business model. It aimed at obtaining guidelines that could help its managers to face the challenges that had been arising and to support future decisions. The chance to study a business network supported by an already developed technological platform and the interest of one of its actors (with the necessary influence to facilitate the access to key information), made it a suitable case to apply our approach. In this phase, BIZ2BIS was still in an embryonic state and had been mainly influenced by the gathered theoretical background. A real case was a useful and necessary opportunity for exploring its suitability to analyze HowMuchIsIt's networked business model and to provide insights about its viability.

6.2.1.2 Potential limitations

During our study, the company that developed the portal decided to suspend its activity (one year and two months after its creation). Although the company had initially agreed to collaborate, a later meeting was never appointed. Given that, we were not able to explore the networked business model's social component or interview most of the relevant participating actors. These restrictions prevented us from comprehending the details about the protocol established with the wholesalers and from obtaining feedback on our assessment and proposals.

6.2.1.3 Description

We started by having a first meeting with a board member of the business incubator where the company that developed the portal was located (18th September 2006). At this meeting, this actor, who acted as a bridge between our research team and the company, transmitted us his interest in analyzing HowMuchIsIt's business model. Taking the conveyed information as a starting point, we gathered additional sources to complement it: press articles (the company and its portal had been extremely advertised), internal documents (regarding the platform specification), and the platform itself.

Using the information obtained through the literature review (Chapter 2 and Chapter 3), we created a first draft of our approach that included the following steps:

1. Identify and characterize the actors;
2. Describe the network context using Structuration Theory and Social Capital;
3. Identify the existing business processes;
4. Describe the network dynamics using ANT's phases;
5. Detail the business activities of the actors;
6. Identify and classify the business flows according to four types: material, information, financial, and influence;
7. Ensure an acceptable trade-off between effort and gain for each actor, based on the available value propositions.

If step 7 failed, the others could be iterated back until condition "7" was fulfilled. After defining these guidelines, we explored their suitability to study this case. Therefore, we analyzed the gathered information about HowMuchIsIt and coded it according to the previously identified seven steps. To clarify open issues, three subsequent interviews were held: two with one of the business incubator project managers (on 24th November, 2006 and on 12th January, 2007) and another with one employee of the development team (on 22nd December, 2006). Since a business model was already in place, we focused on assessing its soundness.

Data on the participating actors (relevance, roles, goals, and their interactions), as well as a description of the business processes were used to outline the business network. Next, we annotated important concepts mentioned in the documentation that could be used to address Structuration Theory's dimensions and ANT's phases. These concepts provided a better knowledge on the network and unveiled clues that were subsequently worked to reach the network balance. Then, we identified the various activities carried out by the actors and the exchanged materials, data, and financial items. We also considered the exerted influences to grasp the program of action inscribed in the network. By detailing the roles of each actor, we were able to disclose the value propositions made available by the business model. However, when we decided to present our findings to the actors and discuss the advantages and disadvantages of their participation in the business model, we were informed that HowMuchIsIt had been suspended. This happened at a crucial moment. Precisely when we needed the actors' collaboration to assess our conclusions – the list of value propositions in terms of gains and efforts – they were no longer available. Since we had already developed the artifacts that the actors would use to evaluate their own perceptions towards the value propositions, we put ourselves in their shoes and filled in the artifacts based on the information gathered during the research. Our goal was not to achieve conclusions about the actors' perception of their participation in the business model, but to explore the suitability of the artifacts. To prevent a premature closure, throughout this study we kept an open mind to other topics that could help us detail the network description and reinforce the alignment of its actors towards a balanced and viable business model.

6.2.1.4 Lessons learned

We analyzed the bonds between the actors of the business model (the company that developed the portal, the portal, individual customers, corporate customers, retailers and wholesalers), the existing business flows, and the provided value propositions, which enabled us to draw some conclusions on HowMuchIsIt. For the development company and its individual and corporate customers, the obtained gain was noticeably greater than the performed efforts to get the business model benefits. However, for retailers and wholesalers, the advantages of participating in this business model were not so straightforward. Retailers could profit if the added income from the portal would be higher than the fixed fees, which had to be paid whether there was a profit or not. They also had the chance to benefit from the discounts agreed with the business model wholesalers, but only if those were greater than the ones they usually got. The wholesalers, in turn, needed their business volume boosted by the portal retailers to justify making discounts higher than those usually done. However, if on the one hand the portal could help to reach new retailers, on the other hand, it could also promote a different type of interaction with old customers that had decided to join the portal. In the latter case, the wholesalers could incur in reviewing and amending their already established commercial agreements.

Our analysis of the HowMuchIsIt business model allowed us to perceive that it relied heavily on the participation of retailers and wholesalers to be attractive, whose gains were the most fragile of all. We could verify that critical mass and sustainable commitment from these actors was never secured. The firm needed 120 contracts to break-even, but only managed to get 20. Furthermore, the less the number of retailers, the less relevant the portal was for customers. The fewer customers, the more unattractive the portal became for retailers.

Since the company might consider a comeback, we offered some suggestions to help mitigate the identified problems. The key issue in the redesigned business model was to improve the benefits for retailers and wholesalers, encouraging their enrolment, as well as their alignment with the network interests. With this goal in mind, we advised the company that developed the portal to end the retailers' annual fee, and implement a small activation rate to access the portal, as well as an additional charge based on the number of clicks in their products. The value to pay could be increased if the retailers decided to strengthen their presence with extra functionalities, such as having their products at the top of the search results or using special sections in the portal to advertise promotions. HowMuchIsIt could also provide free supplementary services to attract retailers, namely aggregated statistical information on the number of product clicks, sales volumes, products sold by geographical area, or other custom reports of interest. Both, this business intelligence platform and the former operational enhancements could be implemented without considerable changes to the portal or to its running costs.

Applying BIZ2BIS to the HowMuchIsIt business model also contributed to refine our approach, since it gave us the chance to detect some faults and to find clues to solve them. For instance, when describing the network we were confronted with a clear limitation: the use of concepts from ANT, Structuration Theory, and Social Capital. The reliance of BIZ2BIS on jargon and concepts from theories that are unfamiliar to most business analysts and practitioners was a barrier to its use. To address this issue and make the approach more accessible we have toned down the visibility of those aspects in normal use. On a positive note, the identification and characterization of the actors did not raise any problems, as well as the description of the business processes. The description of the actors' activities and the representation of the business model flows also proceeded smoothly. We adopted a visual representation inspired by graph notation, where actors can be seen as nodes and the flows among them as directed edges. The developed artifact was our first version of the "Flow diagram" (introduced in section 5.3.1.3). However, we detected a redundancy between the data addressed in the description of the business processes and of the activities performed by the actors. Based on literature on business models and on ANT, we decided that in a first stage it would be enough to identify and detail the activities in which the actors were involved.

During the case study, we identified the need to know what motivated actors to take part in the network business model. We expected to find the ones that could be unsatisfied with their involvement and that could put the network at risk. To avoid these situations, we decided to endow the approach with the ability to point out alternative scenarios that could promote the actors participation. To promote this maneuvering, we conceived a negotiation mechanism to guide the establishment of commitments among actors (inspired by ANT literature). To support its activities, we developed a diagram that depicted the business flows used as bargaining chips among actors (again by arrows, similarly to the "Flow diagram"). Nevertheless, this time the result was not satisfactory. First, because it was complicated to simultaneously analyze the viewpoints of all the actors placed in one diagram; second, because we did not know the importance that they assigned to each flow. Ignoring the perspective of the actors made it difficult to perceive their level of satisfaction, and propose, if required, alternative business model configurations. Our negotiation mechanism clearly needed improvements. In spite of the difficulties in assuring that an alignment among the interests of the actors had been achieved, we used the information gathered on the networked business model (its context, actors, activities, interactions, and value propositions) to evaluate the trade-off for each actor. We developed a first draft version of the "Interview chart", in which we listed all the identified value propositions, their supporting activities and the involved actors. Next, we identified the activities that supported each value proposition and then we started to estimate the gain that each actor would obtain with each value proposition, as well as the effort spent to support it. However, we quickly realized that a reliable assessment had to be done by the actors themselves in order to integrate their own perceptions in the approach and engage them in the decisions taken. But we faced an unexpected difficulty, the HowMuchIsIt business model was suspended and we no longer had access to its actors. Therefore, as a fallback solution, we filled in the evaluation artifact based on the information we collected, which enabled us to sum the estimated efforts and gains for each actor and compare the obtained results. This solution, however, goes against the requirements of "fairness" as a key element of the "authenticity" desired from a trustworthy, rigorous, qualitative research project (Lincoln and Guba, 2000). To be "fair", a project must be able to express the stakeholders' views, concerns, and voices, in order to avoid researcher bias. To respect this, our evaluation was not used to represent the actors' view of the business model, but to perceive the adequacy of our evaluation mechanism as an instrument. Putting this Plan B into practice made us realize that in a normal circumstance (in which the assessment would be made by the actors), the information collected on the networked business model could be used as an additional verification of the data filled in, and vice-versa. For instance, in the "Interview chart", the activities that support a value proposition can confirm the actors involved with it. Similarly, its value propositions can substantiate if the goals pointed out by the actors are being achieved. The information gathered on the networked business model, as well as the information filled in the "Interview chart" must be consistent. Our original evaluation was extremely laborious, clearly showing that a simplification was required.

6.2.2 Case two: Publishing an online journal

Some scientific journals struggle to attract readers and authors, usually suffering from lack of resources. In addition, the current research habits expect to find any information online, meaning that a journal without a web presence may lose visibility. In this context, a Portuguese scientific association decided to publish its journal online. Its aim was to make the journal a reference in the Portuguese scientific community, provide high quality content, make articles available quickly, increase the prestige of the association, give visibility to the ones involved in the journal publication, lower publication costs, provide new publishing opportunities and reach wider access. In order for it to advance, a member of its board launched a project for a student in the Informatics Master Course at the University of Coimbra. In addition, to the development of the online portal, the project intended to scrutinize a suitable business model for the submission of articles, reviews, and their publication. We and the student who took part in the project belonged to the same research group and shared a common interest in business models, which promoted our cooperation and allowed us to explore synergies in our work.

6.2.2.1 Reasons for the study

The journal's business model became an appealing case study due to its network configuration, the need to develop a portal to support its value propositions, and the privileged access to key informants who were committed to the project success. Therefore, based on the outcomes of the HowMuchIsIt case study, we had the chance to refine BIZ2BIS and explore the potentialities of its updated version. Additionally, we could investigate the student's reaction to our approach and perceive if it could be used as a strong communication tool among those involved in the business study. Understanding how our study could contribute to the high-level requirements specification of the information system was also addressed in this case.

6.2.2.2 Potential limitations

When the master project ended, the student left. In spite of there being subsequent contacts between the student, the university, and the association, the portal was never made available online. Furthermore, feedback from the association board about the project's outcomes was unobtainable, namely the adoption of a free or paid business model. This crucial aspect was never decided or implemented. Due to this uncertainty and the apparent abandonment of the project, we did not assess the proposed business model.

6.2.2.3 Description

In an initial meeting with the team responsible for the online journal project (on 30th April, 2007), we discussed the business model to adopt, its supporting information system, involved actors, goals, opportunities, and threats. We also addressed the journal features (e.g., periodicity, interested parties, and accessibility). To complement the information given and identify possible alternative business models of publication, we gathered additional material from papers, Internet pages, press articles, and publishers. The meeting also showed us the difficulties that the student in charge of the development of the online portal was experiencing when describing and representing the business model applied to the journal publication. Taking into account the problems he was facing, the potential of BIZ2BIS to address the scenario under study, and our interest in testing it in a new case, we decided to join efforts and collaborate with the development team.

We started our analysis by identifying the actors of the business model (authors, reviewers, editors, association, the portal, and readers), which were later characterized according to their relevance, relationships, roles and goals. Then, we described the network (e.g., its goals, interactions, rules and sanctions). At the same time, and supported on the results obtained in the HowMuchIsIt project, we moderated the theoretical influences in our approach by introducing the social dimension of the business models in a more subtle way. Thus, we strengthened its independency from theoretical contributions and improved its “user-friendliness”. The fact that we were working with people unfamiliar with ANT, Structuration Theory, and Social Capital (which is expected when studying business models) reinforced this decision. Not having made this choice would have implied that all parties become knowledgeable about these theoretical influences, in addition to their expected work load. This would be difficult to justify, and accept. All that the student expected from our collaboration was obtaining indications on how to represent the business model, as well as to get guidelines to develop its information system. For instance, it was not his aim to learn ANT at a general level.

In collaboration with the student, we examined BIZ2BIS instruments looking for topics that might cause problems of interpretation to end users. The performed analysis allowed us to rethink topics inspired by ANT, Structuration Theory, and Social Capital and led us to “black-boxed” them to end users. For instance, ANT’s translation was one of our greatest influences. Its phases guided us in designing BIZ2BIS and led us to consider the importance of providing a detailed description of the network, as well as a set of guidelines to conduct negotiations among actors. As a first experiment, we described ANT’s phases in text fields, but the dependency on its concepts was too high. Taken into account our aim of limiting ANT’s explicit use, we began to abolish the textual description and structured its content in a set of steps better targeted to the business model analysis. Each step, as well as the artifacts that we developed to support them, followed ANT’s philosophical principles, yet made them unnoticeable to the users. At this point, we acknowledged four steps, whose perspectives complement each other: *Step a "Detect dependencies among goals"* – shows how actors can contribute with their own goals to the ultimate goal(s) of the networked business model and exposes dependencies among the identified goals. The network of dependencies is depicted in the "Common goal diagram"; *Step b "Identify actors affinities"* – detects shared goals among the actors to disclose possible collaborations through the "Actors/Goals affinity chart"; *Step c – "Representation of the business model"* – depicts the identified business flows in the "Flow diagram"; and *Step d – "Negotiate actors contributions"* – identifies the activities that support a critical goal to the network and the personal aspirations that can motivate the actors to carry out needed tasks. It also exposes bargaining chips that may encourage the actors to carry out the activities that support that critical goal. This data is summarized in the "Negotiation diagram".

The information gathered in *Step a*, *Step b*, and *Step c* helped us to perceive the impact of the actors in the networked business model. For example, it gave us clues about the actors' potential of becoming a threat and revealed insights on how to maintain their presence in the network. By understanding the expectations of the actors, or their latent disappointment, BIZ2BIS pointed out counterproposals to mitigate unfavorable situations based on insights from *Step d*. The inclusion of these negotiation features in BIZ2BIS, led us to organize it in three phases: *Phase I "Business model characterization"*, which describes the network and its actors; *Phase II "Business model refinement"* that comprises the four above mentioned steps; and *Phase III "Stability assessment"*, covered in HowMuchIsIt. *Phase I* and *Phase II* were assembled in a report and delivered to the student (on 15th May 2007). Then, he was assigned the task of using "Flow diagrams" to detail the identified flows and value propositions. An updated version of these artifacts was provided on 13th June.

Meanwhile, the development team held a meeting with two members of the association board (on 19th July, 2007). The topics discussed were: the development of the platform, server requirements, administration aspects, the services that the portal should provide, and a balance of positive and negative aspects of a free vs. paid access model to the journal articles. The gathered information was used to aid in the specification of the portal's high-level requirements.

We had meetings with the student every fortnight between May and July to follow the portal implementation, receive feedback, and understand how BIZ2BIS contributed to the portal development. The identified business flows (in particular, information, products, and services) were used to specify the portal features, detail the interactions of the actors with the available services, and the exchanged data. The project finished by the end of September.

6.2.2.4 Lessons learned

The value propositions we identified provided strong indications that it could be advantageous for the journal authors to participate in the business model. They could, for instance, obtain feedback on their work, promote their research, give it more visibility, and enhance their curriculum. However, this positive impact could only be achieved if the recognition of the journal were to become a reality. The same holds true for reviewers and editors - the journal would have a positive impact on their curriculum. The prestige of the journal is also relevant for the association responsible for its publication, since their elements seek acknowledgment for their activities. However, the journal merit depends on aspects as diverse as the quality of the articles submitted by the authors, the excellence of the performed revisions, and the number of references to the articles. To complicate matters, these issues were not under the control of the association, which can only promote actions to encourage other actors to collaborate with their initiatives.

One of the aspects that could influence the participation of the actors in the business model and its success was whether the journal should use a free or a paid model. So, we approached both possibilities. The adoption of a paid model would increase the association's income. Nevertheless, this option presented several risks. Since some online journals provide their articles for free, if any of those do have higher reputation, a paid service would certainly decrease the number of readers. A reduction in the amount of accesses would also have implications on the number of authors interested in publishing (nobody is interested in a journal without readers). Furthermore, a reduction in the number of authors may lead to a crisis of content. A paid model is advantageous for the association, but it could keep the remaining actors away from the portal, compromising the activities that should be carried out to enroll them. On the contrary, a free model attracts readers, but reduces the association's revenues. In alternative, a mix of paid and free content could be explored. For instance, the association would not charge for the more popular content, encouraging accesses, and simultaneously would develop content compelling to niches that due to its specificity could justify a paid access. The association depended on others to enhance the journal prestige and reinforce the networked business model. Therefore, the choice of the business model to adopt had to be made with great care.

We also underlined that the choice of the business model typology could imply the appearance of new actors. For example, if a printed copy were to be produced, a design team would be needed, the printers would be required, and sponsors would be sought. Furthermore, it was clear that the business model success greatly depended on the journal reputation, which led us to provide several suggestions to enhance it: invite recognized authors to write for the journal, select qualified editors and reviewers, provide constructive feedback on the articles, and evaluate the feedback provided by the reviewers to ensure its high standing.

The information gathered in the initial stage of the project created a common background that promoted the business model discussion and its clarification. We were able to detail the network, its actors, their interactions, and debate alternative scenarios. Based on the obtained information, namely the flows of the business model, we disclosed guiding lines that aid us in specifying the portal features. We took into account information flows (data exchanged among actors), material flows (physical materials exchanged among the actors during business transactions) and influence flows. However, we quickly realized that it was necessary to extend their scope. Relevant flows were not being considered, namely non-physical services that should be addressed by the portal, which led us to join them with material flows - both were later named service flows (physical and non-physical). Furthermore, other intangible flows beyond influence had to be taken into account (e.g., the scientific prestige of the journal). We did not consider financial flows in the specification of portal features, due to the uncertainties about the type of business model to adopt (free or paid). In collaboration with the master student, the “Flow diagram” artifact used to represent the business model flows suffered various design refinements throughout the project, with the aim of making its use easier. We all agreed that our initial representation was too intricate. In addition, to facilitate the application of BIZ2BIS, we systematized it in three phases. Specific features of the case, allowed us to give greater emphasis to *Phase II “Business model refinement”* and its steps, for which we developed three artifacts: two of them explored the actors’ goals (our draft versions of the “Common goal diagram” and “Actors/Goals affinity chart” presented in section 5.3.2) and a third balanced the effort and benefits for each actor (a new proposal for the “Negotiation diagram” conceived in HowMuchIsIt). They played an important role in the networked business model’s negotiations, due to the insights they provided when searching for an alignment among the interests of the actors. However, in the latter artifact, we noticed that the conveyed indications were not clear to BIZ2BIS’ users. They had difficulties in understating the impact of the goal under examination on the actors related to it (obtained gain and spent effort). To solve this shortcoming we decided to amend it in future applications.

In this case study, we realized that the inclusion of concepts from ANT, Structuration Theory, and Social Capital in the BIZ2BIS limited its use, since they were alien to the average user. Therefore, we “back-boxed” them to the users, making BIZ2BIS use independent from its theoretical influences and avoiding the users’ awareness of their philosophy. As a result of these adjustments, the master student was able to apply the approach unaware of the theoretical foundations used in its conception.

6.2.3 Case three: GreenHomes

The iTEAM (Integrated Transports and Energy Activity-Based Model) project under the scope of the Program MIT-Portugal needed to access electricity consumption data to support some of its research aims. One of its investigators, which simultaneously worked at the University of Coimbra, decided to gather the necessary conditions to develop a project that could gather that information. The project, named GreenHomes, was conducted at the University of Coimbra, and its aim was to develop a platform that could receive its users’ consumption data per household, every week. In turn, the platform would monitor the obtained data and provide advice to enhance the ecological footprint of its users, as well as tips to reduce their electrical bill. It was expected that a Portuguese environmental association could contribute to make these counseling services available.

According to the initial plans, two types of users were allowed in the platform: “Standard” and “Monitored”. While the data of the former had to be inserted manually, the latter were offered sensors at the beginning of the project that transmitted their data automatically to the platform. The creation of an ecological social network, with the aim of promoting collaborations and encouraging the sharing of environmental information was also planned.

6.2.3.1 Reasons for the study

The complexity of GreenHomes business model made it an appealing case study. Its network configuration, with collective and individual goals that could address interests as diverse as ecological, scientific, and economic - most of the times difficult to conciliate and with meaningful dependencies among them – gave us the chance to see how BIZ2BIS was able to capture and study these scenarios. We had the chance to explore the advantages of organizing the approach in three phases and see how its negotiation mechanism should be applied. Since the business network was also supported by an information system, we also had the opportunity to detail the contribution that the business model study could provide to the development of its underlying information system. Our interest in this case study was also encouraged by its project manager's concern and commitment in evaluating the GreenHomes business model soundness. It gave us strong assurances that we would have access to the case data and that key actors in the business model would be available to provide feedback for our analysis.

6.2.3.2 Potential limitations

With the suspension of the project due to difficulties in maintaining established collaborations and the emergence of financial issues, we lost contact with key actors, as well as the opportunity to receive their feedback and confront our interpretations. This caused several setbacks in our research. For instance, it was not possible to explore the GreenHomes researchers' difficulties in analyzing the trade-off of the actors, only a partial evaluation of our analysis was received, and the business actors did not assess the identified value propositions. In addition, we were not able to use the business model analysis to contribute to the specification of the platform's high-level requirements.

6.2.3.3 Description

On the 17th of December 2008, we had a meeting with a researcher from the University of Coimbra that was working in collaboration with the iTEAM project. He presented us GreenHomes and another project under the scope of the partnership established among these two entities. In both cases, he would be the principal investigator and there were some doubts about the proper business model to adopt. However, as GreenHomes would begin first, the researcher had a preference for its study. Given that we needed a new case to enhance the maturity of our approach, and the fact that both met our selection criteria, we respected the needs and expectations of the researcher and elected GreenHomes as our option. This selection was confirmed in a meeting held on 4th March, 2009, at which we scheduled the future steps of our research.

We systematized *Phase I* in steps to provide an outline of the topics to address when characterizing the networked business model. We supported our decision with the positive feedback obtained in the adoption of this same structure in the Online case study, when we were applying *Phase II*. Then, we created two artifacts to support *Phase I*' steps, which were used to guide the conducted interviews: "Networked business model description chart" and "Actor description chart" (the fisrt versions of the ones presented in BIZ2BIS proposal, section 5.3.1). Meanwhile, the researcher went abroad. Since we could not appoint an interview, we decided to send him the artifacts by e-mail. This was done on the 27th of March, along with a small description of the artifacts' fields. On the 29th of March we received a detailed answer, with excellent feedback. According to the researcher, the artifacts were easy to use and provided a valuable starting point for the project business model understanding. Furthermore, he informed us that his vision of the project had become more comprehensive, beyond the scope of technology and users. In spite of the positive reaction to BIZ2BIS, there were still some lingering questions and doubts about the case itself. As the principal investigator was overseas, a substitute was nominated. However, only on the 4th of June we were able to schedule a new meeting. Here, we conducted another interview with the substitute leader and with the development team (assigned in the meantime), in which we revisited all the topics of the already filled in artifacts. During the interview, we noticed that it would be advantageous to address the network characteristics firstly and detail its actors secondly, contrary to what we had done so far. Having acquired a comprehensive knowledge of the network context first, promoted and enabled the identification of the actors, as well as their characterization. We also perceived that the scope of the artifacts was sufficiently comprehensive to cover and capture the discussed content of the network and its actors. On the 3rd of July it was possible to hold a meeting with the two research leaders and the development team. In order to detect dependencies among the goals of the actors participating in the network, as well as possible affinities among them, our working group initiated Phase II. Together, we applied the two artifacts that support these activities: "Common goal diagram" and "Actors/Goals affinity chart". After explaining how to use the former (it took approximately 5 minutes), we had an insightful discussion about the actors' goals, their dependencies, and how these would support the ultimate goals of the networked business model. The addressed topics were always centered on business model issues and not on the diagram characteristics and use. However, the same did not happen with the second artifact, which depicted the individual goals of each actor in a "pie chart". Each slice represented one goal of the actors in the business model. The ones who aspired to reach a certain goal where placed inside the corresponding slice, disclosing shared interests. We discussed the chart configuration for 20 minutes. The project elements considered its representation unfeasible due to problems of lack of space, even for a medium number of actors and goals. Therefore, we adopted a tabular format.

Based on the feedback obtained in the meetings, over a span of three weeks, we worked on a report that covered BIZ2BIS' *Phase I* and *Phase II*. In *Phase I*, we characterized the network and its actors through the artifacts filled in by the researchers and complemented it with the feedback obtained in the meanwhile. In *Phase II*, we considered how the actors could contribute to the network goals by refining the already developed "Common goal diagram", detected possible collaborations using the new "Actors/Goals affinity chart", and analyzed the trade-off for each actor through the development of several "Negotiation diagrams". We remodeled the latter artifact according to the outcomes of the Online Journal case study. We maintained in this diagram the initial idea of analyzing the aims whose failure could jeopardize the network by identifying their supporting activities and the benefits of the actors responsible for their execution. However, we started to classify the effort spent by the actors in carrying out these activities, as well their relevance for the accomplishment of the critical aims under study. We also considered the influence of these goals on other actors. As a whole, the artifact represents who contributes to a goal achievement and who wins with it, disclosing negotiation targets. After analyzing the dependencies among the several goals in the networked business model, we took into account the performed activities and the exchanged flows, which allowed us to identify the value propositions provided by the business model. The artifacts made it evident that most of the goals could be clustered in two groups: obtain environmental and consumption feedback (the platform users) and achieve research interests (the majority of the remaining actors). As a unifying factor, both groups had ecological awareness. As a point of concern in the business model, we noticed that the success of the research interests strongly depended on the number of users of the platform. Furthermore, the users could obtain environmental tips from alternative, competitive, sources, so this was not an exclusive benefit of GreenHomes. The free energy sensors provided by the iTEAM project was GreenHomes' main advantage, yet only a small number of users had access to this benefit. Given this scenario, and in order to avoid the collapse of the network, we advised the project leaders to improve the attractiveness of the value propositions available for the platform users. The project leaders commented on some of our proposals on the 5th of August 2009. They agreed with our suggestion to diversify and enhance value propositions, and decided to increase the types of provided services. For instance, they proposed the inclusion of automobile fuel and water consumption analysis. Nevertheless, to make this possible, it would be necessary to strengthen ties with the Portuguese Environmental Association, since these new services would largely depend on know-how held by it. We supported this closer collaboration due to the critical need to attract users to the platform. However, and in spite of the indisputable advantages, we alerted the leaders to possible conflicts between these new services and others provided by the association on other platforms. A more active participation of the association could threaten its influence in other networks, and consequently reduce its will to enlarge its collaboration. We tried to establish further contact to receive feedback about other aspects raised in the report, namely alarming trade-offs concerning certain actors or the suitability of the identified value propositions. The project leaders answered by approving our list of value propositions, but asked us to appoint a meeting to clarify those alarming situations. In the next contact (beginning of September), we were informed that the project had been temporarily suspended.

6.2.3.4 Lesson learned

The GreenHomes privileged access to environmental data would have benefited the actors with research interests. The "Monitored users" (those supplied with free energy sensors) would also have the advantage of receiving feedback on their electricity consumption without having to insert data manually in the platform. However, for "Standard users" the gains would not have been so evident. Their effort in manually introducing data, on a weekly basis, would have been very demanding. Furthermore, taken into account that consumption patterns are relatively stable, the need to access to environmental tips on a regular basis is not very engaging. Additional measures to attract these users would have to be considered (e.g., create a strong sense of belonging to the platform ecological social network). To complicate matters, the goals of the researchers depended mostly on these actors, since the budget assigned by the project to equip "Monitored users" was restricted (only 100 to 150 free sensors were available). Moreover, the services supported by the Portuguese Environmental Association overlapped with other services provided by this association on other platforms, which could jeopardize its presence in the business model. It was fundamental for the viability of the platform to perceive the real interest of the association in participating.

In the GreenHomes case study, we observed the potential of BIZ2BIS as a communication tool. Its capacity to integrate the social component in the analysis of the scenario under study brought about a more comprehensive view. We were able to consider key aspects of the business model and of its context, and introduce them into the discussion about the platform development (e.g., actors' expectations, new features to address the interests of the actors, and possible collaborations to enhance the platform potentialities). When conducting interviews to characterize the network and its actors, we also perceived the aptitude of the artifacts developed in *Phase I* to guide the sequence of questions and expose the topics to cover. Their fields were able to account for relevant issues in the networked business model and capture all the data gathered during the interviews. The artifacts usability were also stressed when we, the research leaders, and the development team worked together to identify the actors, their influence and goals, as well as their shared interests. The project leaders contributed to enrich our business model analysis with their comments and also provided input on the usability of the artifacts. We used their suggestions to change the "Actors/Goals affinity chart", and after the amendments the project elements were able to promptly interpret its results. In fact, we used the clues obtained with this artifact to support the discussion of alternative business model configurations. In the delivered report, the only artifact that caused doubts was the "Negotiation diagram" (additional explanations were needed to clarify its outcomes). Misinterpretations of the information conveyed by this diagram can be critical, since its contribution is fundamental in disclosing benefits and disadvantages of the participation of the actors in the business model. Given the relevance of the data in question, we decided to simplify the interpretation of the "Negotiation diagram" results. The GreenHomes team pointed out the need to improve another aspect. In *Phase III*, when assessing the business mode stability, it became overwhelming for them to describe all the activities that had to be carried out to support the identified value propositions in the "Interview chart". At this point, we perceived that this task had already been partially fulfilled in *Phase I*, in the artifact "Actor description chart", when identifying the actors roles in the business model. Thus, to streamline BIZ2BIS and encourage its use, we opted to describe the actors' role in *Phase I* with greater detail, which allowed us to omit an additional description of the activities in *Phase III* (most of the information obtained in the two steps was redundant). When discussing the list of value propositions identified in the report delivered to the researchers, we noticed their interest in understanding how we had reached that list. In order to clarify, we created a procedure to identify the value propositions. Previously, we had always used BIZ2BIS' insights in a non-systematic manner.

With the contributions we gathered in the above three case studies, we fine tuned BIZ2BIS and endowed it with a greater ability to address a rather complex scenario as the InovWine project. We will discuss how action research guided our work throughout this project in the next section.

6.3 Contribution of action research to BIZ2BIS

InovWine is a joint project between entities belonging to the wine industry and to the scientific community. It aims to explore precision agriculture features to achieve significant improvements in the wine production activities in the Portuguese Region of Bairrada. The project explores the knowledge transfer among its business associates, which is expected to contribute to a better utilization of natural resources in the region, leading to its economic and social development. In this section, we chronicle how action research conducted the use of BIZ2BIS in the InovWine project in order to conceive a resilient business model and derive the high-level requirements of its underlying information system.

6.3.1 InovWine research context

Wine production is one of the most traditional Portuguese industries. It has captivated foreign interests, has developed the social and economic conditions of vine growing regions (e.g., creating jobs), and has increased the volume of exportations. Portugal annually exports approximately 600 million euros in wine (Diário Digital / Lusa, 2010), which is particularly relevant in this moment of economic crisis. As mentioned by the Portuguese President, wine is the most important product of our primary sector. Annually it generates almost 900 million euros, which represents roughly 17% of the agricultural industry total production (Diário Digital / Lusa, 2010). Due to its relevance in the national scene, it is fundamental to implement strategies and solutions that can respond to its difficulties and needs, increasing the Portuguese wine competitiveness.

The wine production depends on diverse unmanageable factors (e.g., climate conditions and plagues) and in thorough monitoring. The use of precision agriculture gives leeway to develop new tools to aid in the activities of wine production. In the Portuguese Region of Bairrada, four actors are interested in exploring this field: a wine making cooperative, two technological institutes (one focused on biotechnology and the other on information, communication, and robotic technologies), and a grapevine nursery. The four pondered potential areas that could benefit from technological contributions. These actors possess know-how and experience in different domains, which allowed them to complement their individual perspectives and conceive a project that addresses the wine industry improvement through technological support - it was called InovWine. The project was submitted to NSRF (National Strategic Reference Framework) that constitutes the framing for the application of the Community’s policy for economic and social cohesion in Portugal for the period between 2007-2013, with the support of the Structural Funds and the Cohesion Fund. The InovWine project aims to:

- Create a genotyping system based on molecular methods to obtain the exact identification of the grapevine genetics and aid in its certification. The grapevine credentials will be recorded in RFIDs (Radio Frequency IDentification) that will be implanted in the plants at the grapevine nurseries. This procedure ensures the grapevine variety and allows producers to trace each grapevine history.
- Develop a monitoring and alarm system for the vineyard. This helps producers in their decisions about the vineyard treatments and is based on several sources of information: relevant data on the vineyard characteristics and evolution, as well as biotic and abiotic factors. Biotic factors are produced or caused by living organism, like virus, while abiotic are associated with non-living chemical and physical factors in the environment such as light, temperature, water, and soil. The system would be supported by wireless sensor networks owned by the producers and coupled to a portable interface, so it can be used *in loco*, and in real-time, in vineyards.
- Identify specific wine yeasts that can potentiate the regional grapevine varieties, stressing characteristics demanded by the market. A device for monitoring their dynamics during fermentation should also be developed.

To facilitate reader understanding of the actor interests on the project and of their contribution to accomplish the network goals, we will present a brief description of each:

- Adega Cooperativa de Cantanhede (ACC) – it owns the main wine production area of the Bairrada Demarcated Region. Currently, it counts with around 800 associates and is the largest producer in the region: around 25 to 30% of the total production. The contacts it holds in the Portuguese wine market, its number of associated members, its expertise, and the availability to implement the InovWine project on the ground makes it a priceless partner in the project. Due to its influence over its members, the cooperative will also manage the communication with the producers during the project, mainly with the one that owns the vineyard where the pilot study will be performed. The Adega is the project's main promoter.
- Instituto Pedro Nunes (IPN) – it is a technology transfer organization created by the University of Coimbra. It aims to generate synergies with the business community, promoting a culture of innovation, quality, accuracy and entrepreneurship. This organization has its own technological infrastructure and six laboratories of technological development. The two listed below are involved in InovWine:
  - Laboratório de Informática e Sistemas (LIS) – it provides audit services and consulting, and develops innovative software. In InovWine, it is responsible for developing a database of biotic and abiotic data for the cooperative vineyards. This information will be automatically obtained through devices placed at the vineyard, and manually inserted by the producers. The access to the database can be made

through a mobile system or a computer terminal. At a later stage, LIS will also develop learning algorithms to help producers in their vineyard activities.

- Laboratório de Automação e Sistemas (LAS) – in the scope of an Industrial Instrument Unit, it provides hardware technological solutions and consulting services. In the InovWine project, LAS will deploy a wireless sensor network in the field to monitor and obtain abiotic factors relevant to the vineyard production. This laboratory will also research the best way to implant RFIDs in the grapevines.

- Biocant – situated in Cantanhede, it is the first Portuguese venue entirely devoted to biotechnology. Its main activity is to generate innovative services and products to create value in business initiatives. Under the scope of this project, Biocant proposes the creation of a genotyping system based on molecular methods. This centre is also responsible for developing techniques for the detection of microorganisms in grapevines and wine, and for the identification of new yeasts adapted to Bairrada regional conditions (e.g., climate, soil type).
- Viveiros Vitivinícolas Pierre Boyer (VVPB) – located in Estremoz, it provides certified grapevines that will be used by Biocant in its research. The nursery also contributes with suggestions on how best to embed RFIDs in grapevines. The insertion of RFIDs will be made during the grafting, and will be carried out by the VVPB itself.

6.3.2 Reasons for InovWine study

In addition to the already mentioned chance to collaborate with practitioners, receive their feedback, intervene to solve a complex problem of the wine sector, and contribute with guidelines about the most suitable business model to adopt, InovWine offered us a particularly plentiful and rich scenario. The several networks with influence on the cooperative's business model (e.g., the vineyards and wine certification, or producers' associations) enabled us to observe how the approach incrementally draws the networked business model boundaries. The common interests, the conflicting aspirations, and the undeniable social influences allowed us to assess BIZ2BIS' ability to capture social constraints. The project dynamics was also an opportunity. It gave us access to a scenario that underwent several changes, with close interaction with the particularities and pressures of a real case, and where deadlines had to be accomplished according to the contingencies of its actors. InovWine also gave us the chance to understand if the information gathered through the approach was able to support its negotiation mechanisms in the search for the alignment among the actors' interests, as well the usefulness of the insights obtained in that search. Furthermore, the team responsible by the information system development based their work on our study, providing an independent and accurate feedback of our outcomes. No less important, all these research directions were implicitly exploring our interpretation and integration of ANT's concepts in BIZ2BIS. The InovWine project was funded by European funds, thus the actors are obliged to fulfill the tasks assigned to them in accordance with the project plan. The possibility of incurring penalties (e.g., to return money) gave us extra safety that the project would be conducted until its end, and that we would be able to explore all our research questions.

6.3.3 Potential limitations of the InovWine study

We found three main limitations. First, we had a personal interest in the adoption of our proposals for the InovWine business model and for its supporting information system by the InovWine actors (related with our aims for this dissertation). It was important to our research that the indications obtained using BIZ2BIS were able to guide us to conceive a proposal capable of meeting the expectations of the actors, promoting their participation, streamlining the activities to perform, and contributing to accomplish a viable business model. In these circumstances, our bias could interfere with our ability to assess the suitability of the guidelines provided by BIZ2BIS. To make the appraisal as much as possible independent from our point of view, we minimized possible unconscious influences through the adoption of a research strategy that actively involved all the actors in the analysis and decisions concerning the InovWine business model (group consensus was searched and most of the times achieved). Furthermore, we strengthened our research credibility through several actions: get through a prolonged involvement, carry out a continuous search for wine industry details, follow the interactions of all the actors involved in the business model (who supported us in reviewing the emerging case material), search for new actors able to influence and introduce new perspectives, and use of multiple data sources. Through the provided documentation, the reader can also judge if the story rings true (Klein and Myers, 1999). Second, we were studying a phenomenon that is still very much on-going. When we stopped our collaboration in the project and consequently the contacts with the actors (September 2011) the information system was still in a test phase (e.g., mainly the sensor and the RFIDs), as well as the research and development of biological devices. Thus, no definitive conclusions could be drawn about the success of the proposed business model. Third, given the nature of this research, we cannot draw general predictive statements for all networked business model scenarios, not even for business models related to the wine industry. However, this dissertation provides rich insights, from which we have extracted specific implications for researchers and practitioners (Walsham, 1995b) that desire to discuss, design, and evaluate networked business models supported by information systems.

6.3.4 Chronology of the project

After the acceptance of the InovWine proposal submitted to NSRF, the project leaders considered it important to evaluate the viability of its business model. Since the project had been funded for a period of 3 years, we did not address its development activities. Instead, with the project leaders consent, we focused on the business model that would be in place at the end of the project (after funding was over). To accomplish this purpose, they gave us access to the InovWine proposal, so that we could assess its interest to our research. Given the reasons discussed in section 6.3.2, we agreed to participate. Simultaneously, with the aim of disclosing threats to the InovWine business model, we started to study the supplied documentation about the wine sector. Our research was guided by a protocol established among the participating actors, which addressed the roles to be played, collaboration agreements, deadlines, rights of intellectual property, and how the InovWine results could be exploited commercially.

Our analysis and evaluation of the business model proposed in the NSRF submission enabled us to stress test BIZ2BIS. We started by applying *Phase I* to detail the business model under study, which showed us the need to establish contacts with the participating actors. To make ourselves known to them, we attended a first meeting with representatives of the involved organizations (with exception of the vine nurseries), which broadened our understanding of the project. After an opening statement where InovWine goals were presented, the cooperative and one of its members described the business model in use prior to InovWine Project, provided details of the wine production process, and clarified how the project outcomes could address their main needs and concerns. Taking into account the complexity of the provided information, we decided to follow the actors in the network and capture their own perception of the proposed business model to detail the information available on it. We aimed at gathering data that could help us perceive the soundness of the solution idealized in the proposal submitted to NSRF. To promote and foster our aim, we asked to all parties present at the meeting to collaborate with us. We underlined the idea that their perceptions and expertise were essential to disclose possible problems and conceive a successful business model. The data gathered enabled us to move on to *Phase II* and draw some conclusions about the InovWine business model. We briefly present them below:

- Most cooperative members possess very limited financial resources. They do not have the monetary means to acquire technological devices to deploy in their small parcels of land.
- Producers are not willing to pay an extra cost to ensure the grapevines genetic origin.
- Cooperative's producers lack technological skills and work in the vineyard on a part-time basis.
- The vineyard treatment notifications send by the cooperative, or by the local meteorological station, sometimes do not reach the producers on time.
- The implantation of the current certification process and its legal support prevents the development of an alternative certification system based on RFIDs.

Applying *Phase I* and *Phase II* also provided us relevant feedback on the suitability of BIZ2BIS. We detail the outcomes below:

- The first two steps of *Phase I* allowed us to gather all the information obtained on the network and on its actors' relationships. Still, the contribution of these steps went beyond recording activities. We used the fields of their supporting artifacts as a guideline for the topics to address when studying a networked business model (including the pre-set agenda of the interviews). The detailed description we gathered underlines the aptness of these steps to meet the targets for which we devised them.

- *Step I.c "Representation of the business model"* became part of *Phase I*. At first, it was under *Phase II*, since we conceived it to visually represent the final version of the business model reached at the end of *Phase II*. However, when applying *Phase I* to the InovWine business model, we also felt the need to visually represent other business models relevant to understand the one under study. Furthermore, the ability of *Step I.c* to visually represent the information already covered in the remaining steps of *Phase I* revealed itself extremely useful in promoting discussion and clarifying open issues.

- The awareness that various flows in the business model submitted to NSRF were at risk and could compromise the business model, led us to develop a further step in *Phase II*: *Step II.d "Description of critical dependencies"*. This step introduces a new perspective in our analysis: it identifies the value propositions that depend on a certain flow and the actors who may be affected by the absence of that flow.

- The feedback obtained with the use of the "Negotiation diagram" made us notice that we had miscalculated the ratio between the gain and the effort for the actor that owned a goal under analysis. In addition to consider only the effort that this actor had to undergo to support the goal addressed by the diagram, we also acknowledged the contribution of this actor to other goals directly influenced by the one under analysis. Since this additional exertion corrupted the outcomes of the diagram, we discarded it.

- The InovWine project revealed drawbacks of the approach in coping with the momentum of the project (e.g., the need to obtain information on an ongoing basis and deal with unexpected events). To represent the continuous acquisition of data, display its progression, and capture its intrinsic dynamics, we developed a notation to apply on the "Networked business model description chart" and "Actor description chart" (*Phase I*, *Step I.a* and *Step I.b*).

- BIZ2BIS'outlined plan allows changes between phases and steps. To make it easier to deal with these shifts, we perceived that the granularity of the switching point should be the steps, and not the phases. Whenever BIZ2BIS' users detect that the contribution of a step can be helpful to solve the problem at hand, they should apply it, even if in some cases this can mean a phase shift. Thus, the sequence of the phases, and of its steps, is essentially indicative. It must be adjusted according to the needs of the networked business model under study.

- The complexity of the case urged us to lighten our approach. In *Phase I*, we excluded the extra diagrams developed to show the interactions among the actors (we only kept the "Flow diagram", which was able to cover the main issues addressed by the remaining). In *Phase II*, we also removed the artifact that detailed the activities performed by each actor. We considered that the "Actor description chart" already covered" this topic.

- In several meetings throughout the project, we presented our vision of the business model. In these presentations, we occasionally resorted to concepts such as actor, interaction, network, enrolment, and alignment. Interestingly, we noticed that these terms began to be part of the remaining actors' vocabulary. The adoption of these concepts, even without being aware of ANT, gave rise to a common verbal backing that promoted the networked business model discussion.

As mentioned in the above conclusions about the InovWine business model, the obtained insights on the proposal submitted to NSRF prompted us to identify possible adjustments and start a second iteration of BIZ2BIS. The economic difficulties of the producers led us to propose the development of a network with a larger mesh, able to cover the productive lands of the cooperative members, instead of considering that each producer would install its own network in his parcel. The shared wireless sensor network would not address the specificities of each vineyard, but the ones of the cooperative fields. Furthermore, the lack of technological skills made us establish the need to promote training actions to fight technological illiteracy. We presented these proposals to the actors with the power to decide the future of the business model (ACC, the producers, Biocant, and IPN). They considered our warnings and followed our suggestions. Hence, we started a new iteration of BIZ2BIS to study this updated version of the business model, while also enhancing BIZ2BIS with the feedback obtained in the first. Then, we performed several contacts (e.g., large producers, meteorological stations, ACC, research units) that helped us to understand how to promote the participation of the actors and identify the data that should be used to generate the InovWine treatment warnings. Simultaneously, we initiated negotiations with the participating actors to align their interests, considered alternative solutions to the proposed business model, and developed a report detailing possible future directions (*Phase I* and *Phase II*). The produced documentation was delivered to the actors with decision power. Next, we started to evaluate the actors' perception of the business model (*Phase III*). When the actors agreed with the proposed solution, we specified the high-level requirements of its supporting information system and delivered them to the development team (*Phase IV*). The mentioned activities made us reach the findings briefly described below:

- The identification of business model's problems and the disclosure of alternative solutions pointed out by BIZ2BIS provided valuable outcomes to the actors with the power to decide the future of the InovWine business model.
- All actors considered that their participation would have a positive outcome. Their evaluation was based on the provided value propositions. This feedback gave us additional assurances about the alignment of the actors' interests.
- BIZ2BIS was able to integrate the actors' aspirations in the business model, giving rise to a high-level specification of the information system requirements that respected the network context.
- The development team successfully used the high-level requirements obtained for the information system supporting the networked business model. We were able to define an intermediate step that encompassed a comprehensible outcome of the business model analysis and of its context for practitioners and for the teams responsible for the technical development, bridging both worlds.

- The developed information system's prototypes were presented in several meetings and did not suffer significant changes.

The second iteration of BIZ2BIS in the InovWine project underlined its potential to discuss, design, and evaluate networked business models. We witnessed how it articulates its phases, steps, and artifacts and how they complement each other. How each one depends on those that precede it, supports the following, and reinforces and checks issues pointed out by others, increasing the coherency of the obtained insights. For instance, the development team based themselves on the data detailed in the specification of the services to track in BIZ2BIS' artifacts the value propositions that had led to the identification of these services, their supporting business flows, as well as the activities and the actors that sustain them. In this iteration of BIZ2BIS, we also obtained interesting feedback that enabled the introduction of minor changes in its application. For example, two people with background in production engineering and lean management when looking at the artifacts showed some unwillingness in analyzing all their details. They were expecting to find a quick summary of some artifacts' insights to make it easier to interpret. To meet this requirement, we developed the "Flow matrix" artifact as an alternative representation of the information covered in the "Flow diagram". Besides that, we introduced highlights in other artifacts (e.g., "Negotiation diagram", "Actors/Goals affinity chart", and "Business flows/Value propositions chart") that promptly reveal some of their main indications. The changes introduced and the simplifications carried out in BIZ2BIS' application made it more attractive.

6.3.5 Lessons learned

Applying BIZ2BIS in a case as complex, rich, and challenging as the InovWine project allowed us to confirm its aptitude to conduct analysts in discussing, designing, and evaluating networked business models. Based on its guidelines, we were able to detail the networked business model, identify the actors involved, and create a common background of knowledge to promote the business model discussion between analysts and practitioners. BIZ2BIS' ability to capture the perceptions of the actors and take into account the interplay of interests among them enabled us to detect problems in the business model initially proposed, mediate interests, and suggest alternative solutions.

Moreover, the approach socio-technical view allowed us to consider the context in which InovWine was embedded and enhanced our business model understanding. The acquired knowledge was decisive to scrutinize solutions proposed for the business model and allowed us to support decision makers. Moreover, it enabled us to translate the outcomes of the business model analysis into the high-level requirements of the InovWine information system. The communication of the obtained outcomes to the development team was carried out when the receptiveness of the actors to the provided value propositions was sufficiently positive to justify their participation. The specified high-level requirements disclosed the business model to the members of the development team and guided their work according to the actors' interests and the specificities of the conceived business model, which allowed them to construct a widely accepted prototype. The undisputable consensus around the deployed solution encouraged our belief that the contextual analysis of a given business model can contribute to reduce fails in the development of its underlying information system.

Throughout the project, when practitioners were asked to use BIZ2BIS artifacts, they were able to understand and apply them without difficulties. The close collaboration we established with practitioners enabled us to eliminate detected incoherencies in BIZ2BIS and tune its phases, steps, and artifacts, as well as the sequence of their application. In chapter 7, we selected this project due to its complexity and contributions to our research to illustrate the use of BIZ2BIS.

6.4 Retrospective look over the artifacts of BIZ2BIS

In the previous sections, we detailed how the insights gradually obtained throughout the four cases allowed us to steadily improve BIZ2BIS. We described how its structure evolved, discussed the establishment of its phases and steps, and defined procedures for its use. However, we did not detail the evolution of the artifacts during the research (in particular the changes carried out in their visual representation). We based this decision on two reasons. First, the evolution of the artifacts is best perceived when these are comparatively shown along all cases and not confined to details pertaining to each of them. Second, a detailed description of all the adjustments and advances would be unfeasible due to the lack of space. To reveal the progress of the artifacts, we succinctly present their initial, intermediate, and current versions. First, we will focus on the ones that support *Phase I*.

We started by conceiving an artifact able to support the characterization of networked business models. To define its scope, we searched for inspiration on the performed literature review and tried to understand how the gathered knowledge could help us address the features of the HowMuchIsIt business model. The adopted theoretical influences aided us to identify the fields of the devised artifact, which we called "Networked business model description chart". Its draft version (on the left side of Figure 33) allowed us to describe the networked business model in detail. However, we neglected the need to frame the adopted influences according to the level of expertise of the analysts and practitioners that will use BIZ2BIS. For instance, we assigned to some fields the name of the theoretical concepts that inspired them (e.g. from Structuration Theory or ANT). To avoid this barrier, in the Online Journal case study, we established connections between these concepts and the topics from the business model scenario that these influences led us to address, which allowed us to show just the latter perspective to BIZ2BIS users. The version of the artifact achieved in GreenHomes revealed itself suitable to our purposes and to the needs and background of its users. Therefore, in InovWine it only underwent minor adjustments. This project's major contribution for the artifact was the creation of a basic version control system for the data filled in, which covers the following fields: version number, author, and the date of the last update. To document the evolution of the business model study, we decided to extend the use of the version control system to all BIZ2BIS' artifacts. Moreover, we conceived a notation for textual charts that complements the version control. It visually distinguishes old and new data, incorrect assumptions, and situations that may imply modifications. We present the current version of the developed "Networked business model description chart" on the right side of Figure 33. Our purpose with this figure is to show the evolution of the topics addressed in the several versions of the developed artifacts.

Figure 33: Evolution of the "Networked business model description chart"

The initial version of the "Actor description chart" was also mainly inspired by the literature review (left side of Figure 34). However, our findings from its use in the HowMuchIsIt case study led us to eliminate fields that proved to be dispensable (e.g., relevance of the actor) and introduce others to improve the description of the actors' involvement (e.g., relationships and flows). The Online journal case study also provided analogous developments. The layout of the "Actor description chart" is similar to the one of "Networked business model description chart" and also achieved a stable version in the GreenHomes case. Both use the filling in notation developed in the InovWine (right side of Figure 34). In the visual representation of this artifact, we also assigned a higher relevance to the topics addressed than to their content.

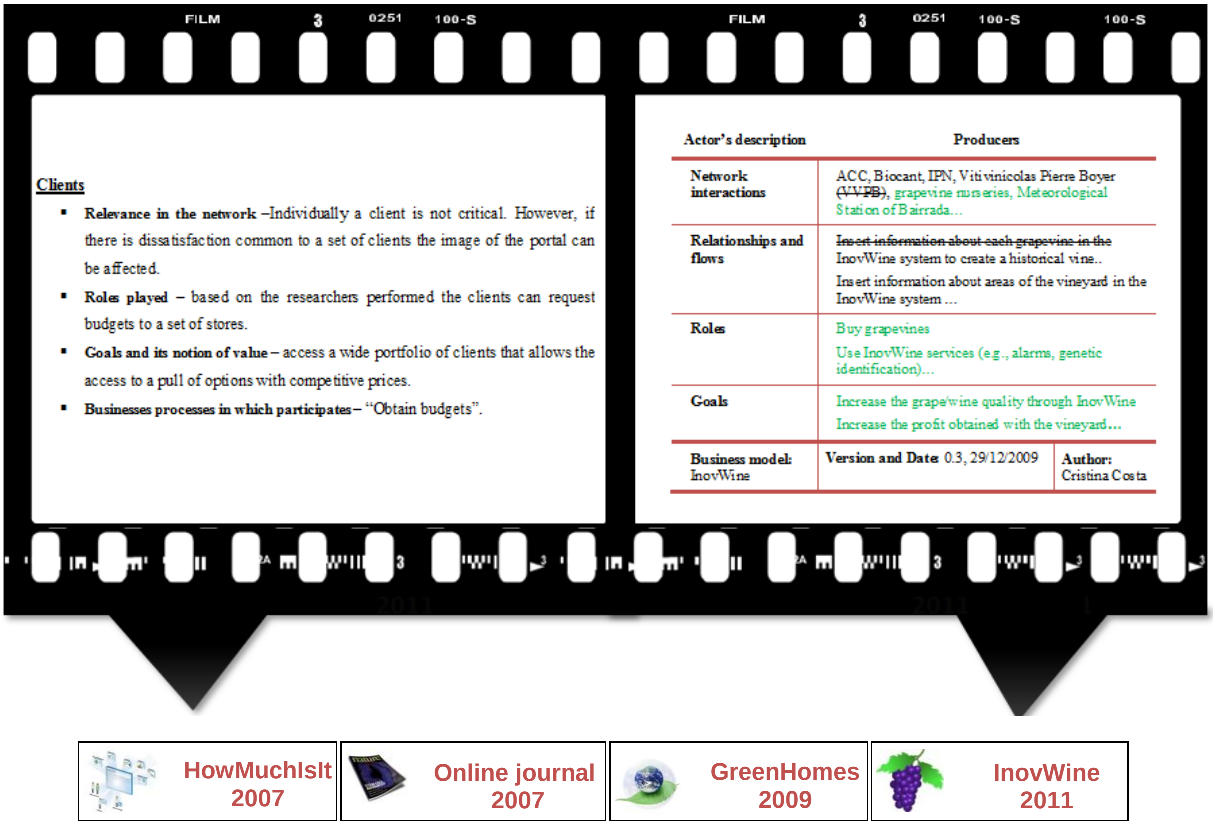


Figure 34: Evolution of the “Actor description chart”

Knowing the importance of representing the existing business flows, we investigated contributions that could aid us to characterize and depict the interactions among the actors. We noticed that researchers tended to rely on diagrams inspired on graph notation and identified five types of flows pointed out as relevant: material, information, financial, influence, and value propositions. In HowMuchIsIt, we used this knowledge to develop our first “Flow diagram”, the figure to the left in Figure 35 (upper part). Later, in the Online Journal case study, we decided to add services that provide non-physical and material items in a type of flow that we called “service”. We also realized the importance of taking into account other types of flows like prestige and customer loyalty that, as well as influence, go beyond the benefits that are accounted in traditional financial measures. We designated them by “intangible” flows. The “Flow diagram” represents distinctly the different types of flows. Still in the Online Journal case study, we changed the visual aspect of the actors in the “Flow diagram” (same strip, lower part) in an attempt to show the gain and the effort associated with each business flow. However, the adoption of this more complex notation hindered the reading and use of the diagram, which made us abandon its use. During GreenHomes case study, we performed several attempts to develop more comprehensive representations of the network interactions. We conceived a set of new artifacts to depict flows among sub-networks, hierarchical dependencies, and actors involved in several networks (second strip to the left in Figure 35). In InovWine, we perceived that these additional diagrams did not bring additional benefits. Thus, we withdrew them and decided to explore additional features of the already conceived artifacts to consider the mentioned topics. For instance, we used the “Flow diagram” to depict sub-networks. In order to introduce in the diagram the idea that each actor is a network, with its own context, we placed the actor inside an oval, and within the same oval a circle that represents the internal network of that same actor. The oval symbolizes the context of the actor (second strip to the right in Figure 35). It is also possible to enrich this notation with extras. For instance, instead of placing a generic symbol of the actors in the centre of the oval (we used a stick figure), BIZ2BIS' users can insert pictures (e.g., an organization chart) or textual descriptions concerning their relevant characteristics. To easily and quickly expose the interactions and the exchanged values among the actors, avoiding the effort of following the arrows in the "Flow diagram", we also decided to provide an alternative representation of this diagram: the "Flow matrix" (first figure to the right in Figure 35). It condenses in the intersection space between one actor (in one row) and the remaining ones (in the columns) the business flows that result from their relationships.

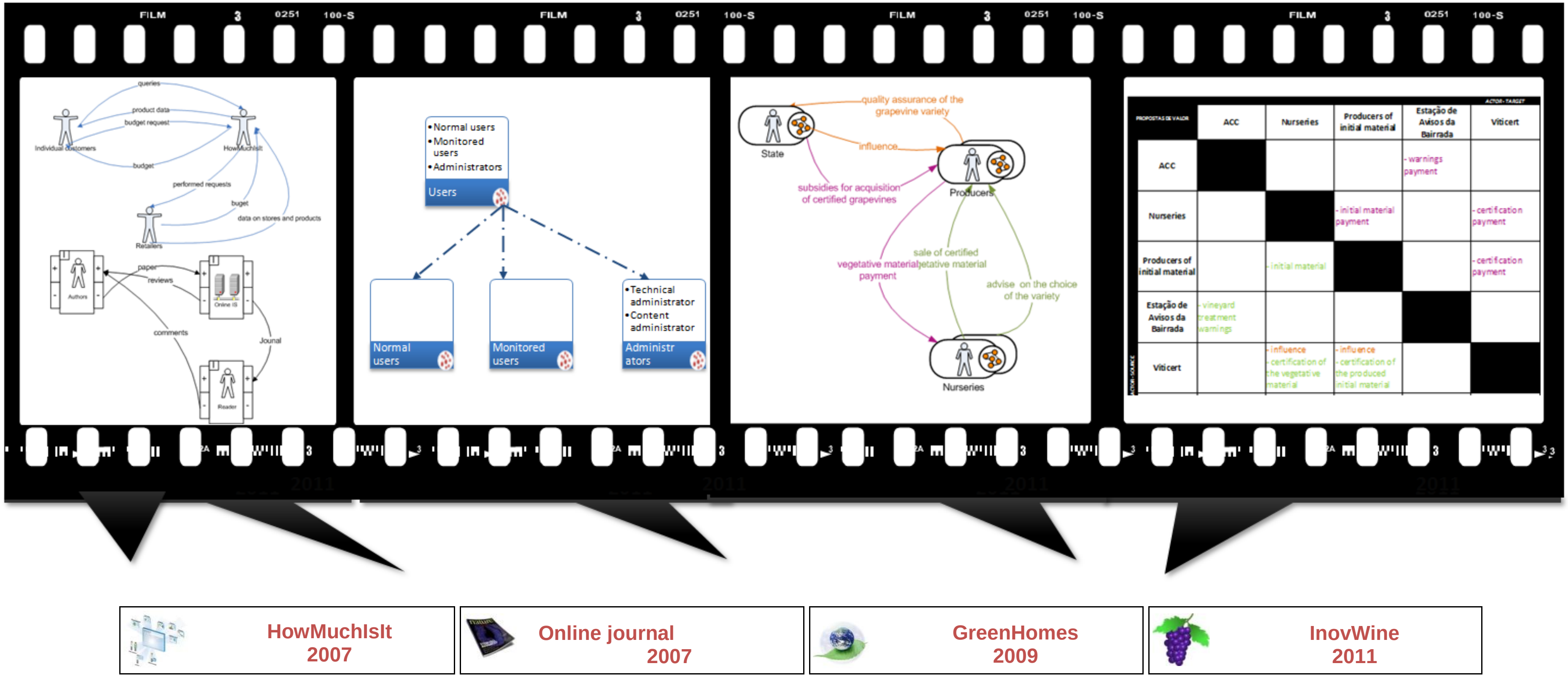


Figure 35: Evolution of the "Flow diagram"

We will now discuss the artifacts developed to support *Phase II*. In HowMuchIsIt case study, we used ANT's four phases as a guideline to understand how the actors could contribute to the aims of the networked business model. Then, based on the obtained knowledge, they also inspired us to conceive a negotiation mechanism that could encourage the participation of the ones involved. At the time, we used a textual description to cover relevant features suggested by ANT, as we show on the left side of Figure 36. However, when adapting ANT's concepts to the context of a business model study, we realized the difficulties that the future users of BIZ2BIS would face if our approach would require them to apply the same procedure. Most of them are not familiar with these concepts, do not know how they should be employed, and are not available for acquiring this type of knowledge. Furthermore, it would be extremely difficult to assure that they will be able to correctly translate ANT's concepts to their own business model context. To make BIZ2BIS independent from the adopted theoretical contributions and the analysts' capacities, we have toned down the visibility of these aspects. We embedded them in the artifacts that support the negotiations among the actors and in the outlined plan developed for the approach. The first artifact we envisioned with this purpose was the "Common goal diagram". Its appearance did not undergo many changes from the Online Journal case study onwards. On the right side of Figure 36, we present the one developed for the InovWine case. It shows how the proponents of the business model idealized the participation of the involved actors taking into account their individual interests, but it does not reveal details on ANT' problematization, interessement, and enrolment.

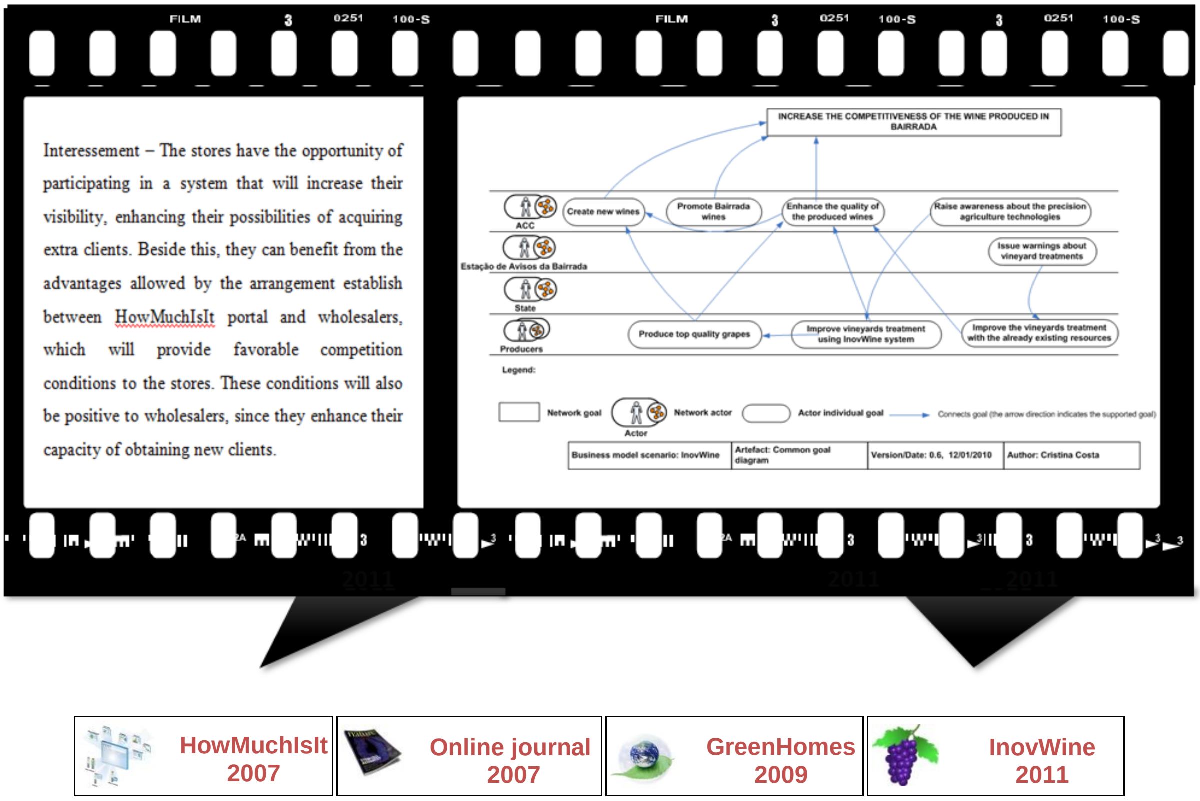


Figure 36: Evolution of the "Common goal diagram"

To identify actors with common interests and explore future collaborations, we began to sketch the “Actors/Goals affinity chart” in the Online Journal case study. Initially, the chart was similar to a “pie chart”. Each slice stood for one goal of the actors in the business model along with the ones that aspired to accomplish it, in order to disclose mutual expectations (left side of Figure 37). In GreenHomes, due to the amount of involved data, it became unmanageable to represent the chart in that format, thus we started to adopt a tabular representation (middle strip in Figure 37). In InovWine we only retouched minor elements of the chart. We decided to count both the number of goals per actor, and the number of actors who shared each goal. For readability, analysts can highlight actors with more goals and the most shared goals (right side of Figure 37).

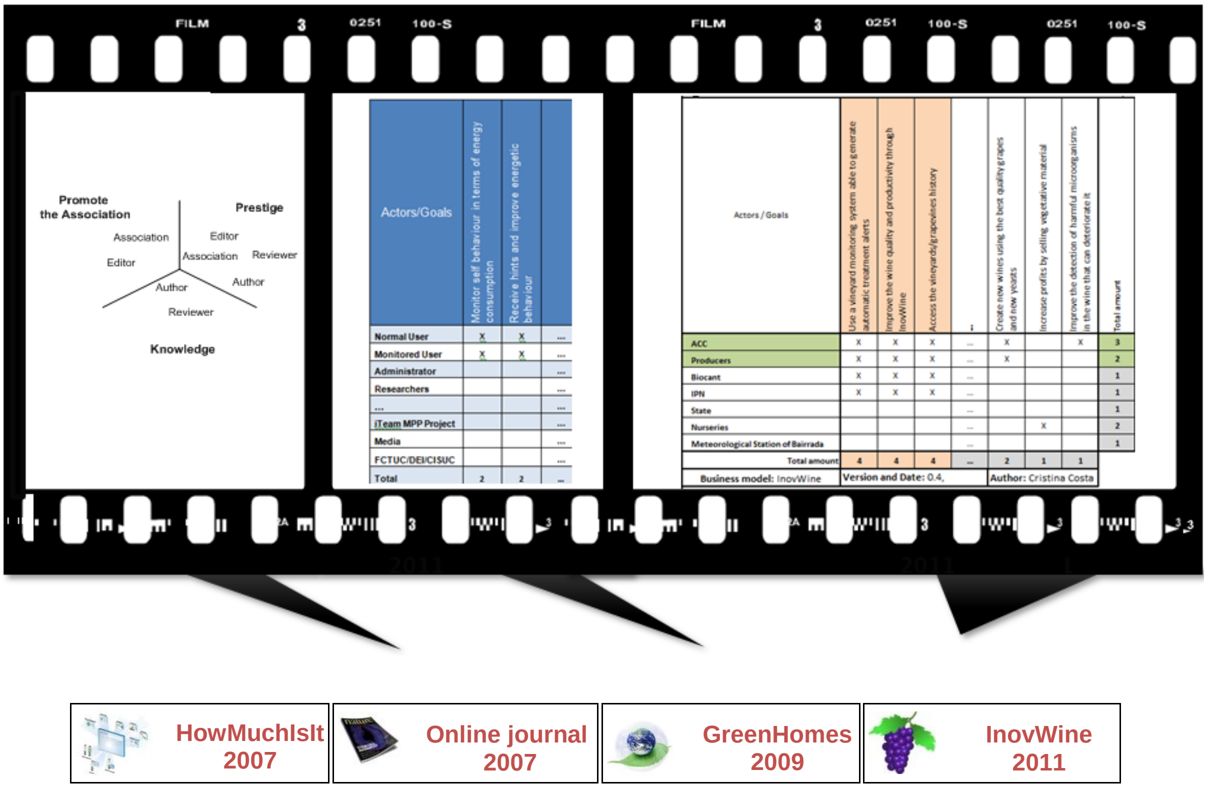


Figure 37: Evolution of the “Actors/Goals affinity chart”

The “Negotiation diagram”, was the one that underwent the most significant amendments from the conceived artifacts. In HowMuchIsIt, we realized that we were not obtaining indications on how the actors could be encouraged to participate or maintain their presence in the business model. To meet this requirement and discover how the interactions of the actors could articulate in the best way, in the Online Journal case study, we created our first version of the diagram (left side, in Figure 38). We used it to analyze the goals specified in the “Common goal diagram”. For each of them, we identified the involved actors, their motivations (M), the activities that contributed to their accomplishment (A), and the objective(s) supported by the goal under observation (O). However, we realized that this procedure was too extensive, laborious, and that it was complex to devise concrete implications for the achieved results. It was necessary to simplify. Therefore, we started to apply the diagram only to goals that could compromise the business model. Moreover, we realized it was unnecessary to point out the motivation of each actor, since this topic was already addressed in the “Actor description chart”. We also noted that we were not developing mechanisms to detect if the balance between the gain and the effort for the goals under analysis (the critical ones) was positive for the involved actors. To meet this requirement, in GreenHomes, we introduced several changes in the “Negotiation diagram” (in the middle of Figure 38). At the bottom, we placed the actors and the activities that support the goal under study, while in its upper part we depicted the gain that this goal provides to the benefits of others. Gains and efforts were rated on a scale of {1,…, 5}. In the InovWine case (right side in Figure 38), we detected that the effort of the actor that owned the goal under study was being considered two times. In addition to the effort that this actor had to carry out to contribute to the goal in analysis, we were also considering this actor effort to support the goals positively influenced by the one under analysis. To exclude this erroneous perception and solve this miscalculation, we disregarded these values and removed the captions concerning that value from the upper part of the diagram. To make it more readable, we introduced a small chart to summarize the efforts spent and the gains obtained by each actor for the goal under study.

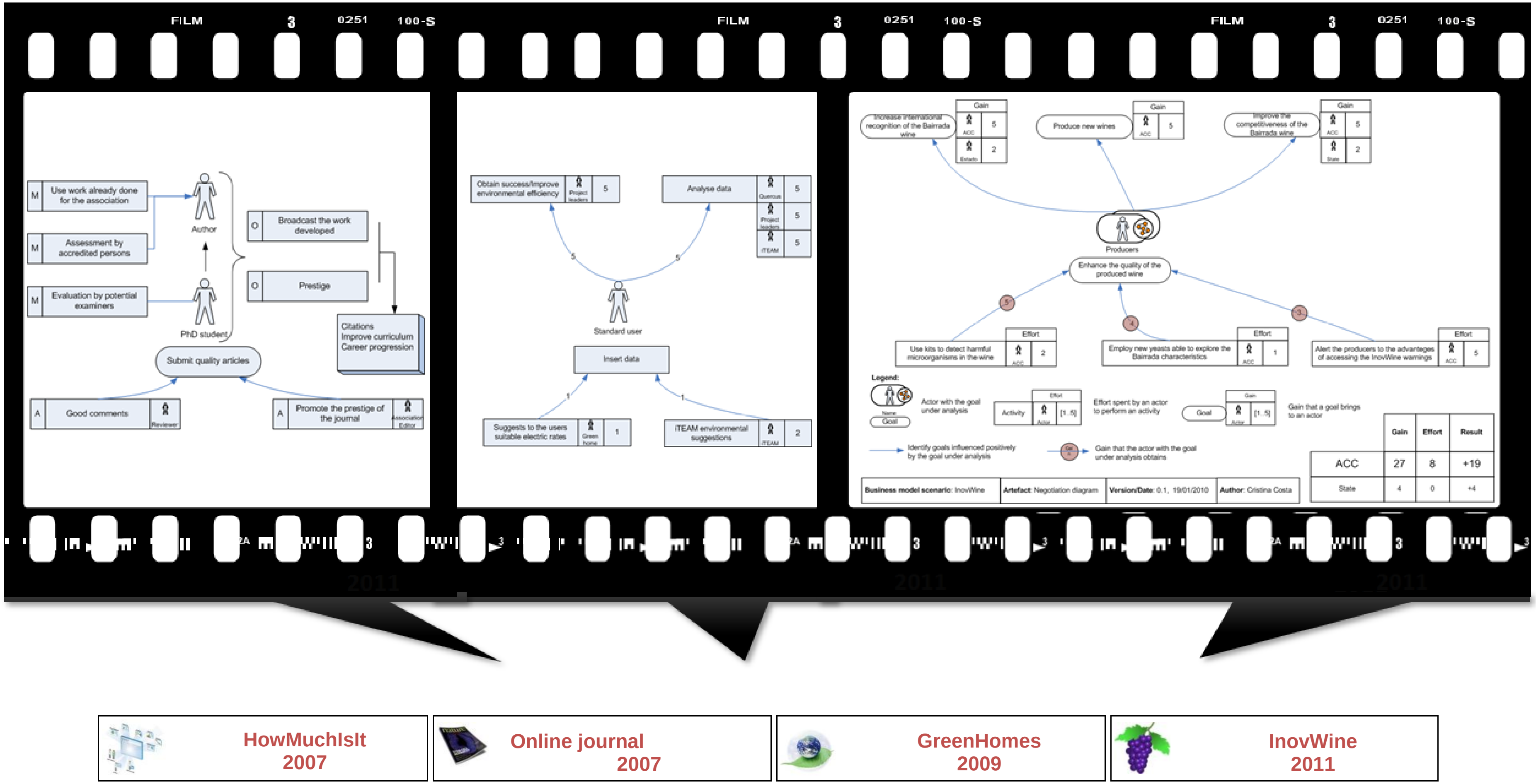


Figure 38: Evolution of the "Negotiation diagram"

We had already noticed in HowMuchIsIt, Online Journal, and GreenHomes case studies that certain business model flows could compromise certain value propositions and cause the collapse of the network. The same happened in the InovWine project. However, the availability of the involved actors to discuss the flows in question and look for alternative solutions showed us the importance of illustrating and transmitting dangerous dependencies caused by the flows at risk. We exposed these threats in the "Dependency flow diagram" (right side of Figure 39), which depicts problematic business flows, value propositions in jeopardy, as well as affected actors. The artifact also details restrictions that influence the business model flows at risk in order to clarify their context. They are inserted in a rectangle linked to each flow. The red "X" on the left side of Figure 39 (as well as in the following figures) symbolizes the absence of this artifact in the cases previous to InovWine.

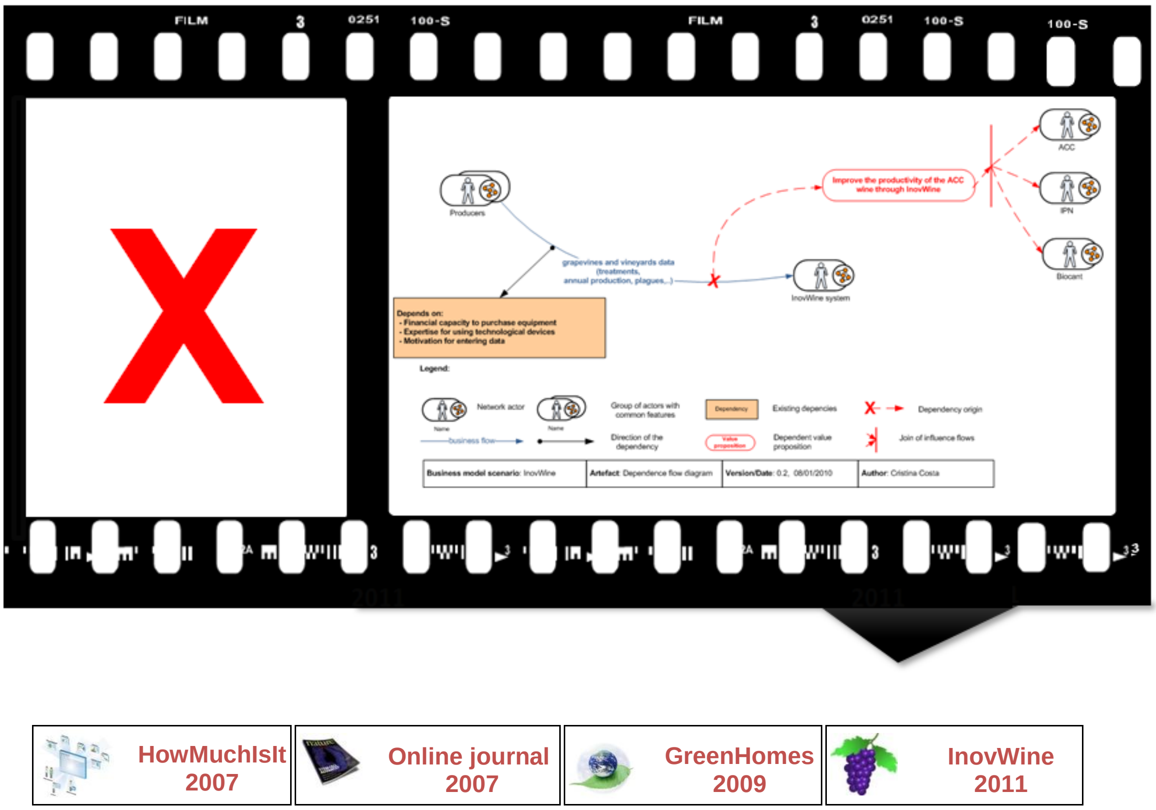


Figure 39: Evolution of the "Dependency diagram"

In the GreenHomes case study, we started to face some difficulties in depicting value propositions using the "Flow diagram", which led us to question the suitability of this representation for this purpose. The InovWine case reinforced this idea, since it became clear that some value propositions did not have an apparent origin or destiny (e.g., "Get prestige in the wine industry", and "Safeguard the Bairrada genetic heritage"). To address this problem and provide a more reliable mechanism to support the identification of the value propositions, we introduced the "Business Flows/Value propositions chart" (right side of Figure 40). The chart uses the information gathered by BIZ2BIS to list the existing business flows (first column) and based on their contribution to the business model (individually or arranged) aids analysts to identify the provided value propositions in a systematized way (first row). To enable the tracking of the flows that contribute to, or influence, a given value proposition, we decided to place an "X" where they intersect. To emphasize value propositions that depend on a higher number of flows, as well as on the flows that support more value propositions, we also introduced fields to show these values in the artifact. For readability, analysts can highlight relevant flows and value propositions. The facility with which practitioners and the contacted experts related business flows and value propositions also strengthened our decision. In addition, knowing the flows, it is easy to backtrack and identify the activities that are behind it, which is fundamental to specify the high-level requirement of the information system.

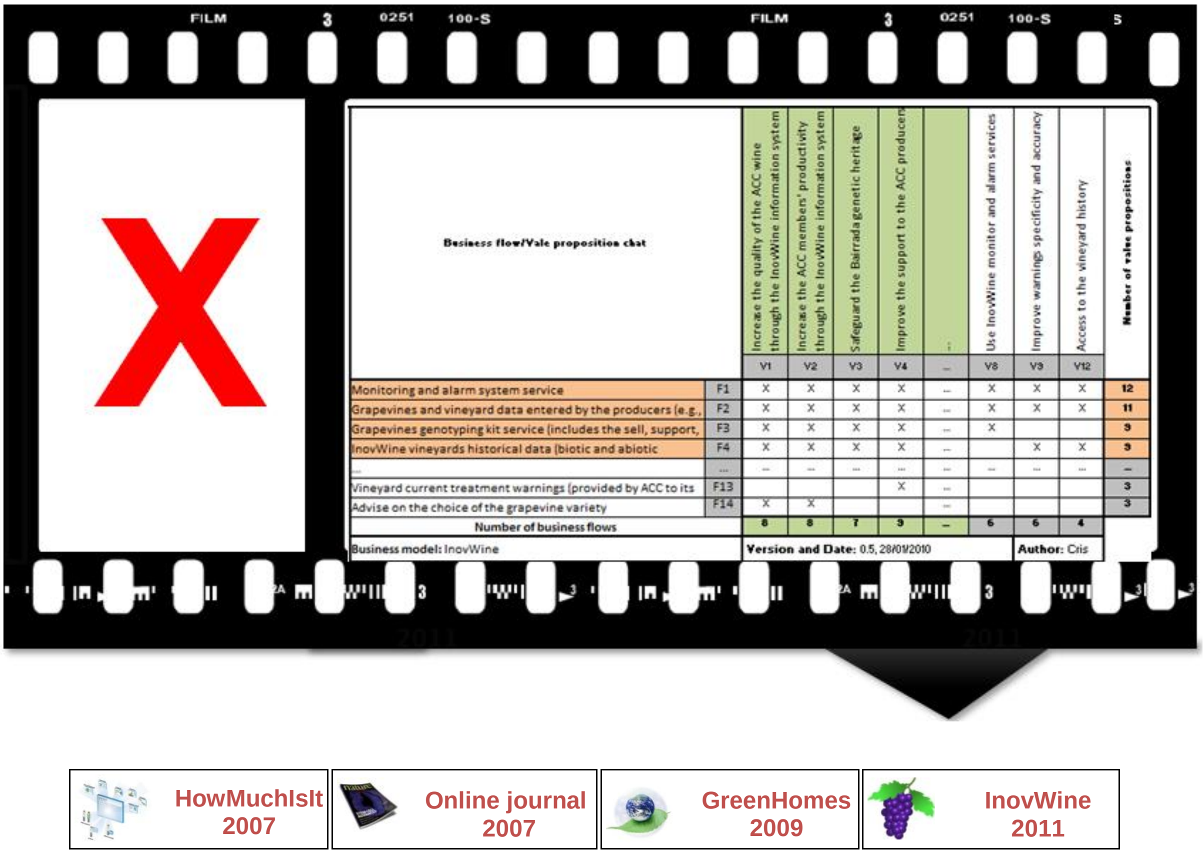


Figure 40: Evolution of the "Business Flows/Value propositions chart"

To confirm if the solution reached for a networked business model meets the expectations of the participating actors, we conceived the "Interview chart" in *Phase III*. When we developed its first version in the HowMuchIsIt case study (illustrated on the left side of Figure 41), we had three main aims: 1 - Identify the activities that contributed to each value proposition according to each actor; 2 - Give them the chance to express their opinion about the gain obtained with the provided value proposition and the effort spent to support it; and 3 - Point out the dependencies among value propositions. However, when filling in the activities that contributed to the value propositions, we perceived that this task was very laborious. Moreover, it was somewhat redundant: the information on the performed activities had already been addressed in each actor's respective “Actor description chart”. It is undeniable that the actors have to take into account their activities to be able to express their gains and efforts concerning each value proposition. However, for this to happen, it is not necessary to require them to list all the activities related to each value proposition. Actors can use the data in other artifacts to support their judgment, avoiding unnecessary effort. In GreenHomes, the practitioners’ negative reaction towards the need to list the activities reinforced our decision to disregard this component. In InovWine, the chart underwent minor changes in order to maintain its appearance consistent with the remaining ones and its use more expeditious. The middle strip in Figure 41 shows its current visual representation. Throughout the case, we noticed that we were not giving due prominence to the dependencies among value propositions pointed out by the actors. Therefore, we developed the “Value proposition traceability diagram”, which visually represents the identified dependencies based on the data filled in the “Interview chart”. If required, it can also show the balance between the obtained gains and the performed efforts for each actor related to a certain critical value proposition. However, the chart is more than an alternative representation of the data filled in the “Interview chart”. Its broad scope details factors identified during the application of BIZ2BIS that can constrain or potentiate each value proposition. We provide an example of this artifact on the right side of Figure 41.

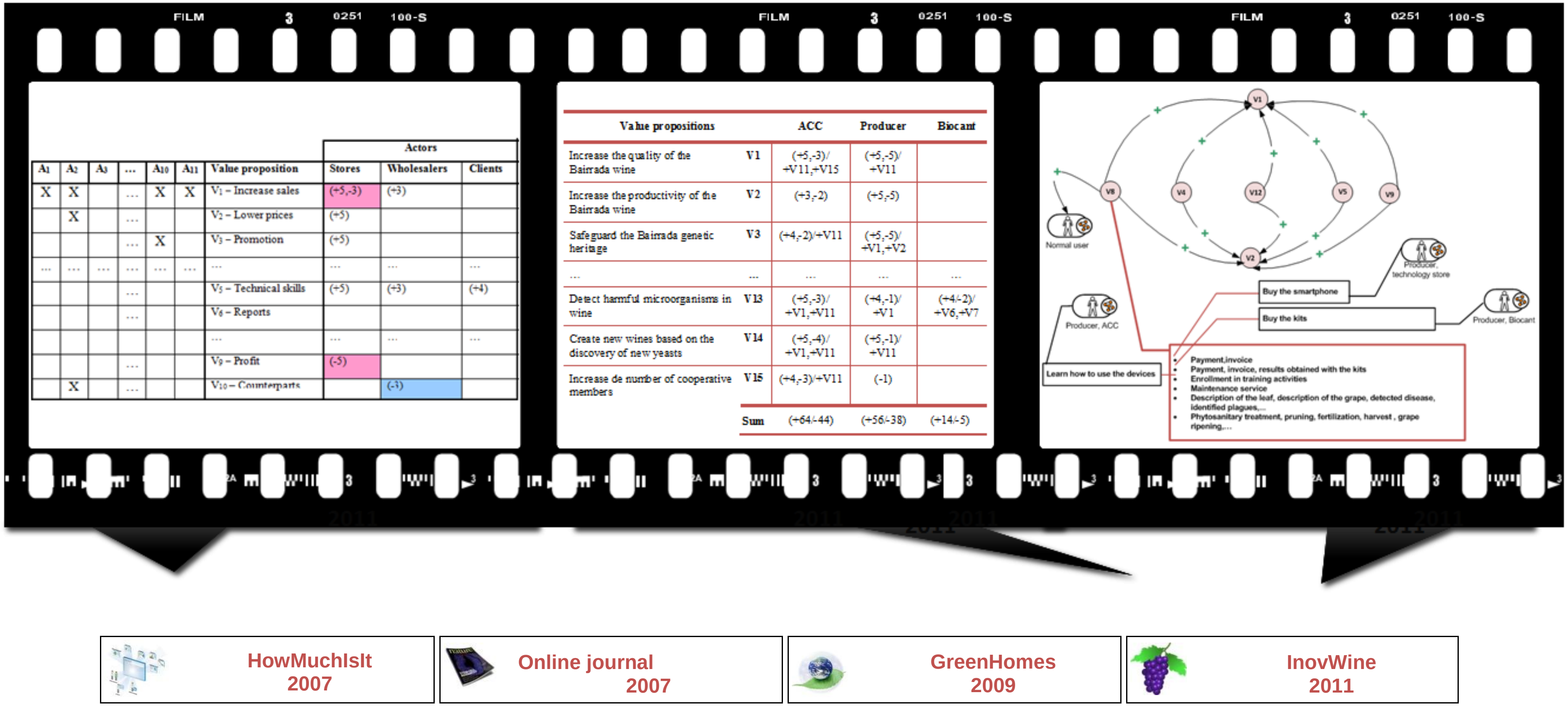


Figure 41: Evolution of the “Interview chart”

The socio-technical perspective applied in this research inspired us to gather information on the networked business model and on its context. In the Online Journal case, we already had the opportunity to verify that the data collected on the existing business flows, the carried out activities, and the provided value propositions could offer valuable indications to identify and detail the features that the business model supporting information system should make available. However, in InovWine, we were able to systematize how the data collected using BIZ2BIS could be handled to detail the services that should be supported by the underlying information system. The obtained knowledge gave us the necessary background to conceive the “Service specification chart” (on the right side of Figure 42). Each artifact describes one service and the complete set constitutes the early requirements of the business model that must be addressed by the information system. All the filled in “Service specification charts” are then delivered to the team responsible for the information system development (or deployment).

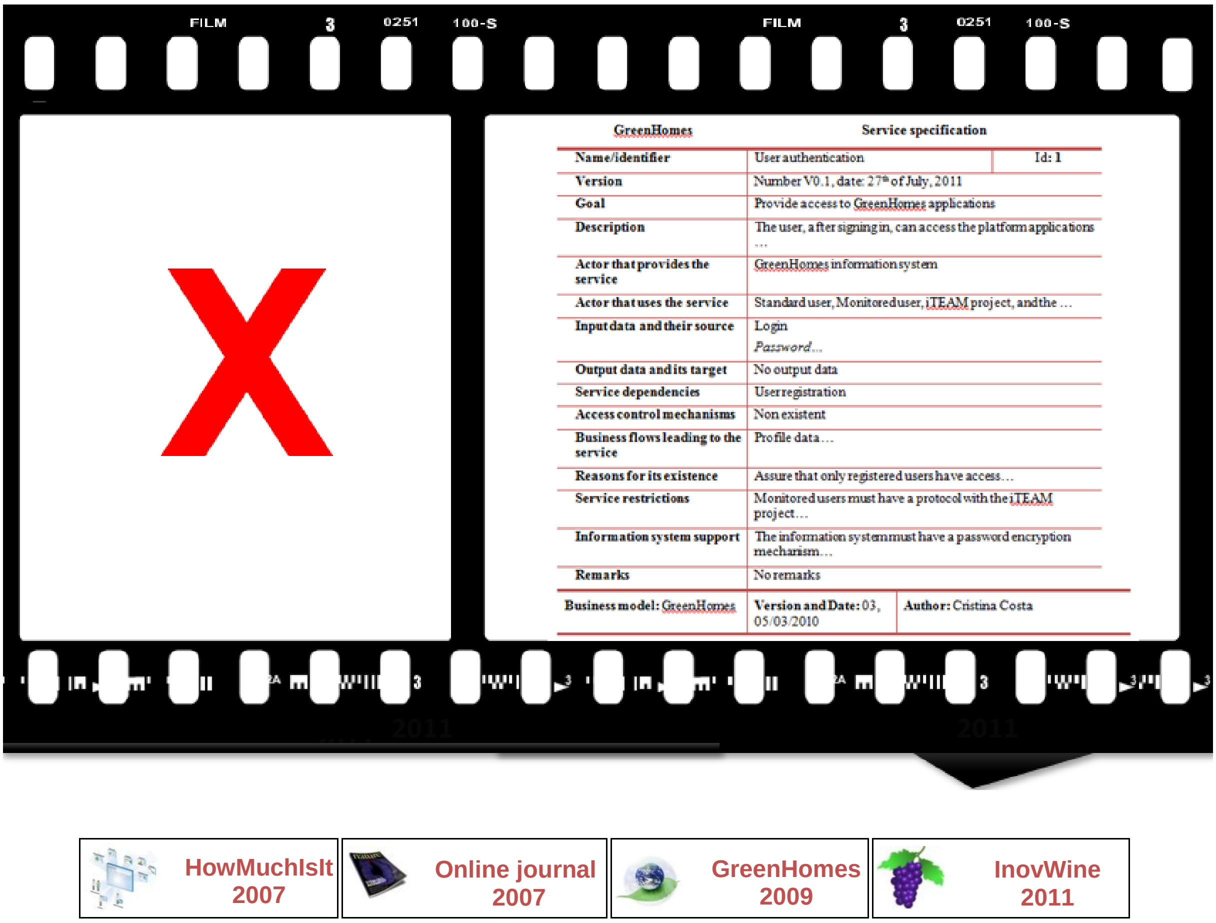


Figure 42: Evolution of the “Service specification chart”

6.5 Conclusion

We started this chapter by succinctly describing and discussing how the case studies HowMuchIsIt, Online Journal, and GreenHomes contributed to BIZ2BIS development (section 6.2). Their findings pointed out future research directions, which allowed us to enhance the maturity of our proposal and tune its consecutive versions. Then, we had the opportunity to apply our approach to the InovWine project. We resorted to action research, which allowed us to reflect on relevant outcomes for the scientific domain and for the practitioners of the wine sector. The complexity of InovWine (e.g., actors with conflicting interests, dependencies among actors, their financial difficulties, and technological illiteracy) gave us the chance to fully explore the BIZ2BIS' features.

In the following chapter, we will exemplify how BIZ2BIS' users can apply it in an intricate real world scenario, underlying its major contributions in two fields: the business model domain and the practitioners' context of the situation in study. We selected InovWine to perform this illustration, due to its completeness, complexity, and the close collaboration established with practitioners.

Chapter 7

InovWine: an example of using BIZ2BIS

7.1 Introduction

In Chapter 5, we described in detail how BIZ2BIS enables the discussion, design, and evaluation of networked business models, as well as the specification of the high-level requirements of their underlying information systems. In Chapter 6, we presented the roadmap to BIZ2BIS, which lays out the contributions it received from HowMuchIsIt, Online journal, and GreenHomes case studies, as well as from the InovWine action research project. In this chapter, we will illustrate with the InovWine example how the future users of BIZ2BIS can apply its general guidelines to a concrete scenario.

InovWine is a joint project between Portuguese actors from the wine industry and from the scientific community. It aims to improve the wine quality and production in the Bairrada Region through the development of new products and services. It is also expected that the project will take full advantage of the natural resources of the Bairrada region, contribute to the protection of the genetic heritage of its wine varieties, and support its economic and social development. We dedicate the core of this chapter to show how we used BIZ2BIS to grasp the project context and how its insights supported us in conceiving a resilient business model and specifying the high-level requirements of its supporting information system. The outline seen in this chapter is just one of the several possible arrangements, since one of BIZ2BIS' characteristics is its capacity to portray business models with different granularities and perspectives, according to its users' preferences, needs, and practices. This particular viewpoint aims at giving a condensed and understandable overview of the business model that will be implemented in the post-InovWine project and how we achieved it. All the details about the conducted study and the resulting documentation (e.g., hypothetic scenarios) can be found on the CD made available with this dissertation. We also expect that this chapter can assist future users in the application of BIZ2BIS to their own contexts.

We organized the chapter as follows: in section 7.2, we describe how we addressed the InovWine project building upon BIZ2BIS' guidelines. We present the initially proposed post-project InovWine business model, compare it with the one in use prior to InovWine project, and take into account the interests of the actors (section 7.2.1). Based on the gathered information, we show how we searched for possible problems and pointed out alternative solutions (section 7.2.2). Next, we present the updated version of the conceived business model and list the value propositions made available (from section 7.2.3 to 7.2.10). After evaluating it according to the actors' perspectives (section 7.2.11), we described how we used the acquired knowledge on the business model and its context to specify the high-level requirements of its underlying information system (section 7.2.12). The last section draws conclusions from the study.

At the end of the chapter, the reader should be able to:

1. Verify how BIZ2BIS answered the needs of the InovWine project, promoted the collaboration with practitioners, and supported interventions carried out in the field;
2. Realize how we applied BIZ2BIS' general guidelines to the specific characteristics of a concrete project and how the actors involved in InovWine used insights provided by the approach to guide their decisions;
3. Ascertain how we used the outcomes obtained from the business model discussion, design, and evaluation to specify the high-level requirements of the information system supporting InovWine.

7.2 An action research study: using BIZ2BIS in the InovWine project

The InovWine project aims to develop a system able to monitor the vineyards and generate actionable advice that can assist producers on activities as diverse as pruning, harvesting, and picking. The system is feed with data entered by the producers via smartphones or a web application, concerning the vineyards care or detected occurrences (e.g., plagues). It also uses data from previous campaigns and data captured by wireless nodes of sensors placed in the vineyards, as well as RFIDS. Together, the obtained mix of historical, real-time, abiotc, and biotic data has the potential to trigger a customized guidance that can support producers in their decision of anticipating, postponing, or cancelling certain actions (e.g., phytosanitary treatments or watering).

Our task was to evaluate the business model envisioned in the proposal submitted to NSRF and, if necessary, make it evolve to create favorable conditions to the success of the post-InovWine project. Moreover, we were responsible for deriving the high-level requirements of the information system to be deployed during the 3 years in which the project was funded. The assignment we were given showed itself suitable for using BIZ2BIS. We noticed the difficulties the actors involved in the project had been facing in representing the project business model. The textual description of the InovWine proposal submitted to NSRF had been the main tool of analysis at their disposal. However, this document was not able to capture the complexity of the business model envisioned for the post-InovWine project. It did not detail the role of each actor, their contribution and exertion, as well as the entanglement of relationships. In addition, it did not provide indications to explore the actors' shared aims and the alignment of their interests.

BIZ2BIS met these needs. We used it to promote the collaboration with practitioners, encourage the business model discussion, facilitate the detection of possible flaws, and endorse the proposal and evaluation of alternative solutions. In addition, BIZ2BIS' socio-technical view enabled us to consider the specific characteristics and needs of the Bairrada region and of the wine sector in Portugal (e.g., lack of financial resources, the resistance of some producers to change, their technological illiteracy, their view of the vineyard activities as a hobby). Below, we will detail how we used BIZ2BIS to appraise the InovWine business model.

7.2.1 Phase I, Step I.a, I.b, I.c - Characterization of the submitted proposal

We initiated our participation in this venture by applying *Phase I*, *Step I.a "Exploration of the business model"* to the proposal submitted to NSRF. We sought in the available documentation aspects that we could use to clarify the fields covered in the "Networked business model description chart" that we present in Table 20. To complement it, we developed efforts to enhance our knowledge on the wine sector, in particular in the Bairrada Region. We attended colloquia and consulted several sources such as magazines, Internet resources, books, and technical reports. Our improved sensitivity of the sector helped us to understand factors pertinent to the wine production such as vineyard treatments, plagues, diseases, grapevine varieties, and yeasts. We used the collected information (in collaboration with practitioners) to progressively detail the "Networked business model description chart" (Table 20).

Table 20: InovWine's networked business model description (proposal submitted to NSRF)

Business model scenario	**InovWine**	
Network goals	Increase the competitiveness of the wine produced in the Portuguese Centro Region (Dão and Bairrada)	
Network opportunities	Protect the Dão and Bairada's wine varieties, namely: their genetic heritage and their indigenous vine microflora Bet on the exclusivity of the geomorphologic soil's characteristics and of the climate influence on the vegetative cycle of dominant autochthonous varieties Create specific yeasts that can explore and maximize the quality of the Portuguese wine, in alternative to the generic yeasts available Explore precision agriculture features to achieve significant improvements in the Portuguese Centro Region farming efficiency Explore symbiosis among the fields of biotechnology, agronomy, electronic and informatics engineering to develop new products or services (for example, vineyard alarm systems) Combine advanced scientific knowledge to the awareness of the traditional economical agents in order to obtain an interesting cost/quality relationship and increase productivity Enable new wines to enter the market Use RFIDs (Radio Frequency IDentification) to certificate the vines (an RFID must be implanted per vine)	
Existing rules	The producers must pay their quotas in exchange for the services provided by the cooperative The producers are obliged to deliver all their production to ACC (it is common knowledge the existence of unapproved sales) The ACC's members must respect the cooperative statutes Grapes with more quality receive a higher payment by ACC. The quality depends on the wine degree and on biological properties of the grape (e.g., level of grey rot, acid rot, fermentative activity, and bacterial activity) The ACC only pays to its members when the wine is introduced in the market (it takes approximately two years) The new yeasts must respect the intrinsic characteristics of the Bairrada region wines	
Version: 0.2	**Date:** 15/10/2010	**Author:** Cristina Costa

The "Networked business model description chart" in Table 20 allowed us to outline the business model conceived in the proposal and the vision of its proponents for the roles that the actors should take. Based on the collected data and the preliminary identification of actors available in the proposal submitted to the NSRF, we moved to *Phase I*, *Step I.b "Description of the participating actors"* and created the artifact "Actor description chart" for each identified actor. We present the artifacts in Table 21 to Table 27.

Table 21: Associação Cooperativa de Cantanhede description (proposal submitted to NSRF)

Actor's description	**Associação cooperativa de Cantanhede (ACC)**	
Network interactions	Producers, Biocant, IPN	
Relationships and flows	Receive grapes from the producers Pay grapes to producers Place the wine in the market Receive clients' payments Receive services from the InovWine information system (monitoring and automatic alarms) Receive services from Biocant (molecular characterization kit, microorganism identification test kit, identification of new yeasts)	
Business model: InovWine	**Version and Date:** 0.2, 15/10/2010	**Author:** Cristina Costa

Table 22: Producers description (proposal submitted to NSRF)

Actor's description	**Producers**	
Network interactions	ACC, Biocant, IPN, Viveiros Vitivinícolas Pierre Boyer (VVPB)	
Relationships and flows	Insert information about each grapevine in the InovWine system to create a historical vine data set that can be used by the ACC and other producers Insert information about the vineyard in the InovWine system to create a historical data set that can be used by the ACC and other producers Receive information and services from the ACC Deliver grapes to ACC Make use of services from the InovWine system Buy services from IPN and Biocant Purchase vines implanted with RFID technology to VVPB	
Business model: InovWine	**Version and Date:** 0.3, 15/10/2010	**Author:** Cristina Costa

Table 23: Biocant description (proposal submitted to NSRF)

Actor's description	**Biocant**	
Network interactions	Producers, ACC	
Relationships and flows	Sell molecular characterization kits (producers, ACC, and nurseries) Sell microorganism identification test kits (producers, ACC, and nurseries)	
Business model: InovWine	**Version and Date:** 0.2, 15/10/2010	**Author:** Cristina Costa

Table 24: IPN - LIS description (proposal submitted to NSRF)

Actor's description	**IPN – LIS**	
Network interactions	Producers, ACC	
Relationships and flows	Sell add-ons to the InovWine information system (producers and ACC)	
Business model: InovWine	**Version and Date:** 0.2, 15/10/2010	**Author:** Cristina Costa

Table 25: IPN - LAS description (proposal submitted to NSRF)

Actor's description	**IPN – LAS**	
Network interactions	Producers, ACC	
Relationships and flows	Sell wireless sensor networks and RFID technology (producers, and the ACC)	
Business model: InovWine	**Version and Date:** 0.2, 15/10/2010	**Author:** Cristina Costa

Table 26: VVPB description (proposal submitted to NSRF)

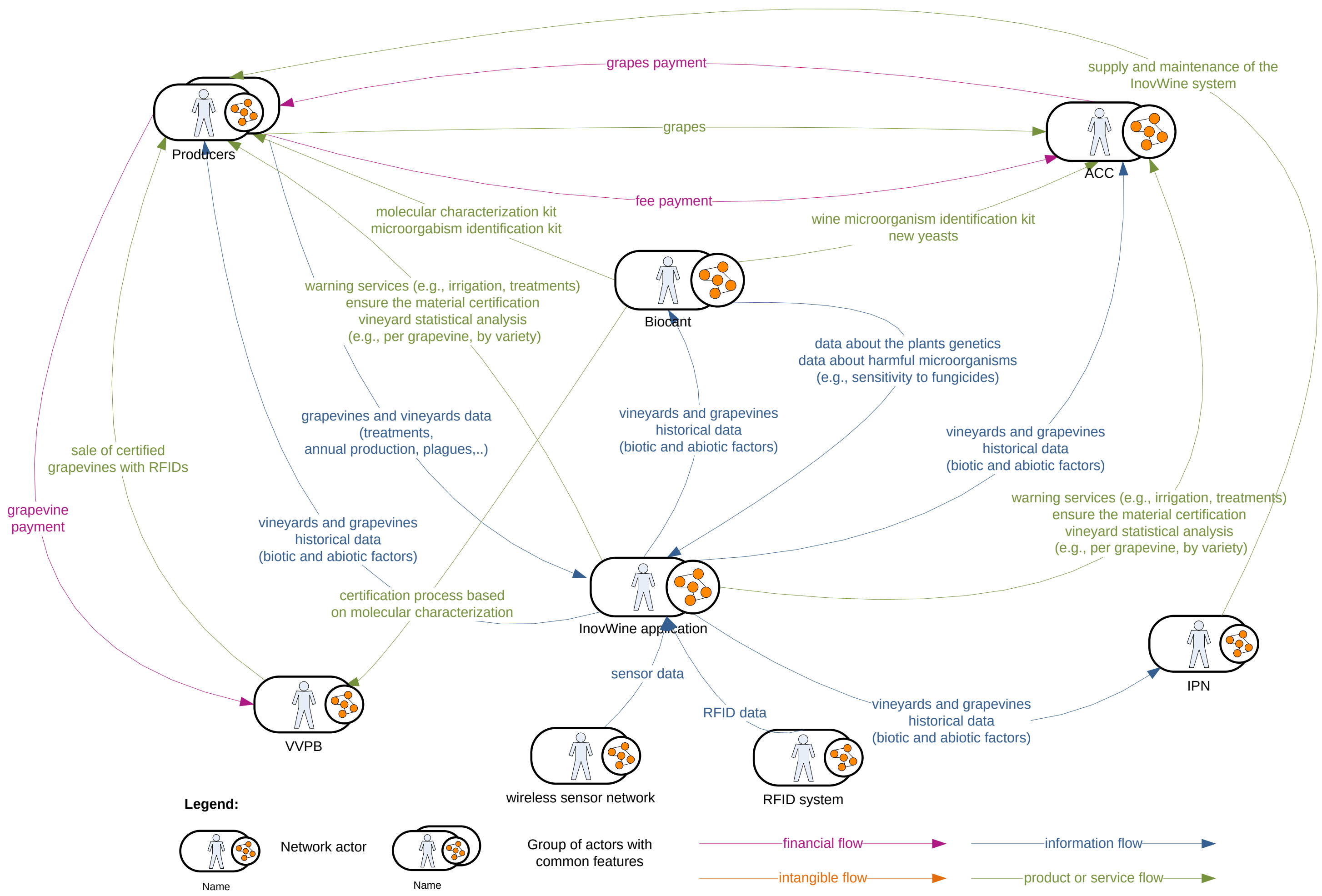
Actor's description	**Viveiros Vitivinícolas Pierre Boyer (VVPB)**	
Network interactions	Producers	
Relationships and flows	Sell grapevines to producers Provide services to aid producers in the selection of suitable grape varieties Offer after sale support to clarify how the grapevines should be treated	
Business model: InovWine	**Version and Date:** 0.2, 15/10/2010	**Author:** Cristina Costa

Table 27: IPN – InovWine application description (proposal submitted to NSRF)

Actor's description	**Inovwine system**	
Network interactions	ACC , Producers, IPN, Biocant	
Relationships and flows	Receive the data of each grapevine from the producer Receive vineyard data from the producer Receive data from the wireless sensor networks and from the RFIDs Provide a service of monitoring and automatic alarms for the vineyard (producers, and the ACC) Provide access to the grapevines and vineyards historical data set (producers, and the ACC) Receive data from the molecular characterization kits (producers, and the nurseries) Receive data from microorganism identification test kits (ACC, producers, and nurseries)	
Business model: InovWine	**Version and Date**: 0.2, 15/10/2010	**Author:** Cristina Costa

The "Actor description charts" above (see Table 21 to Table 27) gather data obtained on the actors in the proposal submitted to the NSRF. For each one, they present the existing interactions and detail the established relationships. We used this information to advance to *Phase I*, *Step I.c "Representation of the business model"* and depict the actor's interactions through the "Flow diagram" presented in Figure 43. For instance, it shows that the producers deliver their grapes (a product or service flow) to the ACC, which in turn pays them (financial flow). They enter grapevines and vineyards data (information flow) and receive warnings (a product or service flow). We note that the majority of services provided by the InovWine system depend on the data entered by the producers.

The "Flow diagram" in Figure 43 assembles and summarizes the business flows among the actors participating in the InovWine business model, as described in the proposal submitted to the NSRF. This diagram revealed to be a very practical artifact to incrementally build or explain business models under study. We used it several times to backup their description from ground zero, covering all its steps, gradually adding new data to the diagram, until we addressed all their details. The provided incremental vision supports understanding and promotes the debate of the adopted solutions. In the meetings that took place to discuss the originally proposed business model and future alternatives, actors often mentioned the business model in use prior to InovWine project to justify their opinions. They used it to explain how they envisioned their participation in the business model that will be put in place in the post InovWine project stage. This reference led us to turn our attention to the one in use (which does not exploit the features of the InovWine system) and to apply *Phase I* to it to broaden our understanding on its context, activities, problems faced, and the daily needs of the actors. Furthermore, we used this additional analysis to complement and counterbalance our findings in the proposal submitted to NSRF and obtain additional guarantees on the completeness of our study. Our most valuable information in this process came from meetings and open and semi-structured interviews, a total of 27 engagements, that spanned the period from May 2010 until September 2011, as detailed in the agenda in Appendix A. It involved discussions with executives and employees from a wine cooperative, Biocant, producers big and small, grapevine nurseries, the agency responsible for the grapevine certification, and other organizations with impact on the wine sector (e.g., a meteorological station and an agriculture research institute). We also resorted to e-mails and phone calls to clarify subsequent doubts. Their expertise transmitted us a more complete view of the Portuguese wine context. Similarly to what we did when trying to understand the business model included in the proposal submitted to NSRF, we started by applying *Step I.a "Exploration of the business model"* to characterize the business model prior to InovWine project and *Step I.b "Description of the participating actors"* to detail its actors. The artifacts of these steps guided us while we conducted the performed interviews, which enabled us to complement each field with relevant data to the post project business model.



Business model scenario: InovWine	**Artefact**: Flow diagram	**Version/Date**: 0.2, 07/01/2011	**Author**: Cristina Costa

Figure 43: Flow diagram of the InovWine business model proposed in the NSRF submission

We began by interviewing the actors identified in the NSRF proposal. Since actors cannot be viewed in isolation, we asked them to disclose their ties and tracked them (following the guidelines presented in Chapter 5). When new actors were pointed out, we also questioned them about their own connections. We recursively followed them, which enabled us to perceive their context and time frame, as well as how their interests could be articulated to achieve a common solution. We stopped following the actor links when the new identified actors had a residual influence on the business model context. We will mention the exposed actors, whenever they are relevant to the analysis of the post project business model. Next, we will briefly describe the information obtained in meetings and interviews that proved to be extremely important to broaden our understanding.

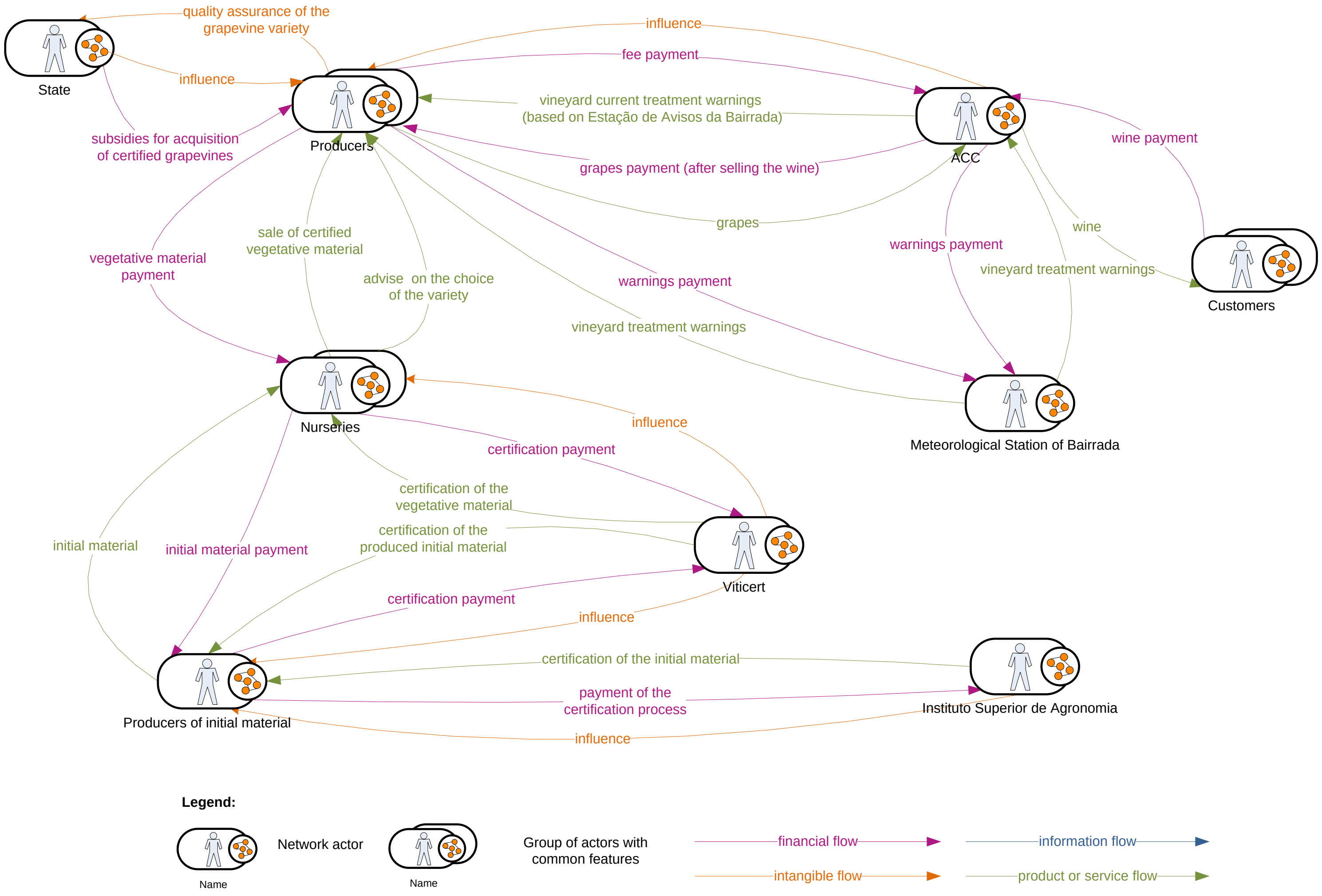
In our first meeting with the majority of the actors involved in the project (on the 26th of May 2010 - Appendix A), we were informed that the actors representing the interests of Dão Region had abandoned the project. From this moment on, we focused the business model goals exclusively on the Bairrada Region. Then, on the 2nd of July 2010, we held an interview with the cooperative representatives (Appendix A). This allowed us to detect a new actor who had not been previously identified: the Meteorological Station of Bairrada. This actor possesses a significant impact in the business model prior to InovWine project, since it provides a paid warning service to the ACC and to its members. The service is based on the weather and on the vineyard conditions, describes the activities that must be carried out by the producers in the treatments of their lands, and its warnings are printed and published on the Internet approximately every three months. However, we noticed that they were not specific to the vineyards, and were relatively superficial – only having two to three pages. Given that not all producers have adhered to the service, the cooperative tries to broadcast the warnings as much as possible among its members (around 800 growers), in person or by phone. However, this task is not always easy, due to the number of people involved, the costs implicated, and the lack of technological skills of the producers. According to the ACC, the difficulty in reaching them is one of the handicaps that must be overcome with InovWine.

In conjunction with the cooperative, we also discussed the importance of identifying the environmental factors with influence on the vineyard productivity, in order to select and acquire the appropriate sensors for their measurement. Furthermore, we underlined the importance of detecting the critical points as to where the sensor nodes should be installed in the pilot study vineyard. We requested to the cooperative, in collaboration with the producers, to reach a first draft of relevant environmental factors and of the critical points. Due to regular occurrence of thefts in the region, we were advised to install the electronic devices discretely in the vineyards. In that same meeting, we simultaneously examined how the cooperative estimates the amount to pay to the producers for their grapes. The cooperative representatives present in the interview explained to us that the value depends on the grape quality and that the cooperative calculates it based on a set of pre-established parameters, such as the wine alcoholic degree and biological properties of the grape (e.g. grey rot, acid rot, fermentative activity, and bacterial activity). The cooperative uses a machine called wine scan (set up according to their parameters) to perform the accurate calculation. This value materializes the quality assigned to the grapes by the ACC and is usually paid two years after its delivery. According to the cooperative statutes, its members must deliver to it all their production. It also became clear at this meeting that one of the Cooperative's greatest interests in InovWine is to discover new yeasts able to potentiate the characteristics of the Bairrada wine. On the 7th of September 2010, we visited the cooperative during the harvest period. One of its employees explained us the steps carried out by the producers to deliver their grapes and we observed all the circuit they performed, including how the wine scan collects a sample from each producer and assigns it a value. It was evident the importance that the grape quality has to the producers. The value calculated by the wine scan is the culmination of a year's work and allows them to perceive the gross profit obtained with their vineyards.

The interview with Viveiros Vitivinícolas Pierre Boyer (VVPB), on the 13th of September (Appendix A) enlightened us on the procedures in the grapevine nurseries. One member of the nursery staff described how they treated the grapevines since their acquisition (when they are merely sticks) up until they are sold to the producers, covering issues like their grafting, their time in stratification chambers, and their plantation. They also told us that the price of grapevines in the nurseries were around 0.80 euros. Taking this value into account, the implant of the RFID system in the nurseries would increase the cost of the grapevines in roughly 50%. This discovery has become even more relevant when they told us that 50% of the nursery production is usually lost. In this interview, we also became aware that the nurseries only plant certified grapevines to assure the origin of their variety and their phytosanitary conditions. According to VVPB, there are two types of certification: certified and standard. In the former, the plant material comes from the grapevines' original material maintained by the Estação Vitivinícola Nacional in its fields. The propagative material is homologated at the Instituto Superior de Agronomia, in order to be sold to producers that own initial vineyards. In these vineyards, the producers are obliged to use production techniques that assure the quality of the approved material. In Portugal, they are the nurseries' largest source of supply. In the latter type of certification, the plant material has its origin in producers that have obtained high quality grapevines, and that decided to certify them to obtain authorization to their commercialization (also at Instituto Superior de Agronomia). The cost of certification is equal in both cases.

The VVPB interview is a perfect example of how BIZ2BIS' users can enhance their perception of the network by following the actors and the indications that emerge during discussions. For instance, we used the gathered data to identify new actors. We already mentioned two of them in the previous paragraph: the Instituto Superior de Agronomia (approves the vegetative material that will be used to plant certified vineyards of initial material) and the producer of initial material (uses the approved material to plant their own vineyards to produce plants that will be sold to the grapevine nurseries). Others were: Viticert, which certifies the material produced in the grapevine nurseries (its work covers around 90% of existing grapevine nurseries - the majority situated in the Portuguese Western region), and the Direcção Regional de Agricultura e Pescas that controls 5% of the work developed by Viticert (based on a random sample). It is also worth mentioning that the Portuguese Government, supported by European funds, has provided grants, for the time being, to plant certified grapevines, fostering this sector. Viticert also revealed itself a valuable contribution to the project and opened new perspectives to the InovWine business model study. In a meeting with this certification agency, on the 25th of November 2010, one of its members shed light on the certification mechanisms, on its bureaucratic and legal components, and on how InovWine solution could complement traditional certification activities. Furthermore, by following the activities of this actor and with its collaboration, we were able to establish contacts with influent researchers in the wine domain, large producers, and nurseries (meetings that took place between December 2010 and January 2011).

We used the information gathered in the interviews above to complement the fields of *Step I.a* and *Step I.b* supporting artifacts with data relevant to the post-project. Since it was not our aim to characterize all the details of the business model in use prior to InovWine Project, we did not apply *Step I.a* and *Step I.b* to it. However, to give the chance to discuss this business model whenever necessary in an expeditious way, we used the gathered knowledge to apply BIZ2BIS' *Phase I*, *Step I.c "Representation of the business model"* and used the "Flow diagram" presented in Figure 44 to depict it. Since this version of the business model is independent from the InovWine application and will not change much throughout this study, we also created *Step I.c* "Flow matrix" (Matrix 2) to enhance the readability of the information available.



Business model scenario: InovWine	**Artefact**: Flow diagram	**Version/Date**: 0.3, 06/01/2011	**Author**: Cristina Costa

Figure 44: Flow diagram of the cooperative business model prior to InovWine Project

ACTOR - TARGET

ACTOR - SOURCE

Value propositions	ACC	Nurseries	Producers of initial material	Meteorological Station of Bairrada	Viticert	Producers	Customers	State / QREN	Instituto Superior de Agronomia
ACC				- warnings payment		- influence - grapes payment (after selling the wine)	-wine		
Nurseries			- initial material payment		- certification payment	- sale of certified vegetative material			
Producers of initial material		- initial material			- certification payment				- payment of the certification process
Meteorological Station of Bairrada	- vineyard treatment warnings					- advise the producers on the choice of the variety			
Viticert		- influence - certification of the vegetative material	- influence - certification of the produced initial material						
Producers	- fee payment - grapes	- vegetative material payment		- warnings payment				- quality assurance of the grapevine variety	
Customers	- wine payment								
State / QREN						- influence - subsidies for acquisition of certified			
Instituto Superior de Agronomia			- Influence - certification of the initial material						

Business model: InovWine	**Version and Date:** 0.1, 08/01/2011	**Author:** Cristina Costa

Matrix 2: Flow matrix of the cooperative business model prior to InovWine Project

In collaboration with actors, we progressively gathered the data depicted in the two above supporting artifacts of *Step I.c*. Our efforts to characterize the actors and understand their role led us to consider the business model in use prior to InovWine Project, which aided us to capture their vision for the post project InovWine business model. By taking into account the actors' perceptions and interests, we combined details of the proposal submitted to NSRF (section 7.2.1 - Characterization of the submitted proposal, *Phase I*, *Step I.a* and *Step I.b,* see Table 20 to Table 27) with the vision of the actors for the post project phase along with meaningful features of the business model in use prior to InovWine Project. We present the updated version of the "Networked business model description chart" in Table 28 and the "Actor description charts" from Table 29 to Table 37. Supported by the actors' feedback, we could complement the knowledge already obtained on the networked business model, correct misunderstandings, detect possible threats to its adoption, and unveil new directions that can reinforce its success. In order to illustrate the progression of our knowledge throughout the case, we used the notation described in Chapter 5 to fill in the charts with the data obtained up to, and beyond, our first contact with Viticert. To differentiate these two time periods: we write information already known in normal text, black font, and the one that is latter discovered in normal text, green font. The notation also identifies incorrect assumptions (strikethrough text) and proposals to detected problems (capital letters, red font). As observed, the used notation enhances the artifacts readability. Despite the high amount of available information, it is easy to perceive the topics obtained until and after that interview, also changes carried out, and new possible directions for the business model.

We opted to present the two charts together in order to underline how we used them in the field, and their close relationships. In InovWine, we started by detailing the network, but to avoid interrupting the flow of the discussion in the conducted interviews, it was necessary to address aspects specific of a particular actor many times. This obliged us to keep going back and forth, from one artifact to the other, to explore their full potential and all the provided information. Due to restrictions in the dissertation size and to avoid redundant information, only the final version of both charts is present in this section.

Table 28: InovWine's updated networked business model scenario

Business model scenario	InovWine
Network goals	~~Increase the competitiveness of the wine produced in the Portuguese Centro Region (Dão and Bairrada)~~ Increase the competitiveness of the wine produced in Bairrada
Network opportunities	Take advantage of the internationally recognized quality of Bairrada wine (for example, prizes obtained between 2002 to 2006: 9 gold, 36 silver, and 27 bronze medals; in 2012, by August: 4 gold, 2 silver, and 1 bronze medals) Protect the ~~Dão and~~ Bairada's wine variety, namely: their genetic heritage and their indigenous vine microflora Create specific yeasts that can explore and maximize the quality of the Portuguese wine, in alternative to the generic yeasts available Bet on the exclusivity of the geomorphologic soil's characteristics and of the climate influence on the vegetative cycle of dominant autochthonous

Business model scenario	InovWine
	varieties Explore precision agriculture features to achieve significant improvements in the Portuguese Centro Region farming efficiency Explore symbiosis among the fields of biotechnology, agronomy, electronic and informatics engineering to develop new products or services (for example, vineyard alarm systems) Combine advanced scientific knowledge to the awareness of the traditional economical agents in order to obtain an interesting cost/quality relationship and increase productivity Enable new wine to enter the market. In particular, the ones that possess Baga in their composition (it is the dominant variety in Bairrada, it represents around 80% of the region wine production) CREATE SYNERGIES WITH THE METEOROLOGICAL STATION OF BAIRRADA TO ENHANCE THE SPECIFICITY OF THEIR WARNINGS ACCORDING TO THE CHARACTERISTICS OF THE BAIRRADA REGION ~~Use RFIDs (Radio Frequency Identification) to certificate the vines (an RFIDs must be inserted per vine)~~
Network threats	The Bairrada region consists mainly of small producers without economic conditions to buy expensive technological equipment from their own budget The cooperative members do not have the skills or knowledge to deal with technology (e.g., Internet access, or use smartphones) The ACC does not have its own sources of investment devoted to the project The European community support for the wine sector will probably end in 2013 State budget cuts due to the current economic crisis which may involve the reduction of governmental support (e.g., to plant grapevines) Tax increase due to the current economic crisis (e.g., IRS) The number of abandoned vineyards has grown, increasing the chance of spreading plagues to the vineyards where the equipment has been placed
Mutual obligations and expectations	THE METEOROLOGICAL STATION OF BAIRRADA issue warning services for the ACC and some of its members in exchange for a fee Producers pay quotas in exchange for services provided by the cooperative ACC, Biocant, IPN should promote the project ACC should establish contacts with entities from the wine world MAJOR PRODUCERS HAVE EXPRESSED THEIR INTEREST IN THE INOVWINE APPLICATION, BUT IN ORDER TO BUY IT, THEY MUST OBTAIN EVIDENCE THAT IT IS WORKING PROPERLY MAJOR PRODUCERS ARE INTERESTED IN USING RFID TECHNOLOGY TO ACCESS THE VINEYARD HISTORY, BUT NOT FOR ALL ITS GRAPEVINES. THEY FIND IT BETTER TO DIVIDE THE VINEYARD IN AREAS (E.G., PER ROW) AND IMPLANT ONE RFID IN ONE OF THE GRAPEVINES OF EACH AREA VITICERT HAS INTEREST IN A MICROORGANISM IDENTIFICATION TEST KIT FOR THE VINEYARD THE ESTAÇÃO VITIVINÍCOLA NACIONAL ACKNOWLEDGES THE ADVANTAGES IN OBTAINING THE HISTORY OF THE INITIAL MATERIAL (CERTIFIED PLANTS) AND TRACKING ITS GROWTH THROUGH RFIDS

Business model scenario	InovWine
Shared interpretations and representations	The process of cultivation and treatment of the vineyards takes place over several months (e.g., pruning is done in October, November; treatments begin in April, the harvest is done in August and September) The vineyard treatments are costly: from 700 to 1200 euros per hectare The cooperative has approximately 800 members The fields of the cooperative members are in its majority small The wine certification processes: Denominação de Origem Controlada (DOC) and Regional Beiras are carried out by the Comissão Vitivinícola da Bairrada (it sells guarantee seals for the approved wines) Small farmers have a very low investment capacity. It consists essentially in state subsidies The warning services provided by the Meteorological Station of Bairrada do not always arrive in time to producers Meteorological station of Bairrada hired collaborators that on a daily basis report by post complementary meteorological data from small stations installed on their fields The cooperative has some difficulties in broadcasting the warnings to its members that did not subscribe to the service provided by the meteorological station. For instance, the majority of the producers do not use Internet and have difficulty reading SMS (short message service) The ACC has no way of ensuring that the vineyards of its associates are certified The yeasts presently used in wine production do not take into account the intrinsic characteristics of the Bairrada Region. They are the result of a study conducted in France To identify the representative clone of a variety, 200 plants are marked in Portugal. These plants are placed in an experimental field where aspects such as degree, aroma and color are analyzed. Of these 200, one is selected and three are homologated. From the latter 10 plants are obtained, which constitute the initial grapevine plant-material collection The initial collection is used for the establishment of new initial planting vineyards (10 initial plants can give rise to 100 plants), which in turn produce thousands of certified plants The value of an initial vineyard plant is around 2 euros The producer will be able to introduce data on the vineyard in the field The initial grapevine collection and the initial planting vineyards are called mother vineyards. From the moment the producers register these vineyards, their sticks can be commercialized The grapevine sticks are composed by several bud sticks (or scion) that once united with the rootstock are called grafts In November/December scions and rootstocks are chosen for the grapevine nursery. The grafts are made in February/March and covered with paraffin. After this, they go to a germination chamber (for 2 to 3 weeks, at a temperature of 35 degrees, and 80% of humidity). The grafts go to the field in May and remain there until November. They are planted in December 50% of the grapevine nursery production is lost There are abiotic factors (e.g., type of soil and geographical location of the vineyard) that influence the choice of the grapevine variety The grapevine certification process assures the variety of the grapevines and their phytosanitary conditions There are two basic types of grapevine certification programs: certified and standard. In the former the plant material comes from the grapevine's original material, which is analyzed by the Instituto Superior de

Business model scenario	InovWine
	AGRONOMIA in order to homologate them and validate their propagative material. In the latter, the plant material has its origin in producers that have obtained high quality grapevines and that decided to submit them for evaluation (also at the INSTITUTO SUPERIOR DE AGRONOMIA) to obtain authorization for its commercialization
	The cost of both certifications is identical
	The Baga variety has only standard certification (it has never been proposed to homologation)
	The activities of the grapevine nurseries are controlled by the DIRECÇÃO GERAL DA AGRICULTURA. In Portugal's West Region this task was assigned to VITICERT
	Certification costs are equal for all the nurseries
	The price of a grapevine from the nursery is around 0.8 euros
	The price of an RFID is approximately 0,4 euros
	Wine producers only receive GOVERNMENT's grants to plant certified grapevines
	In some old vineyards the grapevine variety is unknown
	The grapevines identification is traditionally based on morphological descriptors (ampelography). It compares shape and color of the grapevine leaves, buds, and grapes
	Expertise in grapevine ampelography is confined to a restricted number of specialists. This number has suffered reductions due to the number of skilled people who have reached retirement age
	Within the same variety there are clones that behave distinctly, which makes genotyping more difficult
	Young plants are almost impossible to classify, because they still do not exhibit the typical morphological features of adult plants
	Simple sequence repeats (SSRs) or micro-satellites are DNA markers that allow the creation of DNA profiles. These can be used in grapevine identification, to determine parent–progeny relationships in grapes, trace grapevines, and evaluate their genetic variability
	SSRs do not explore mutations. They do not distinguish variants of the same clone
	SSRs have already been identified for all varieties, providing a common platform of knowledge. The same is not true for Single Nucleotide Polymorphism (SNPs)
	SSRs are much more expensive and slower than SNPs
	The high density of SNPs makes them valuable for genome mapping, in particular, for the generation of ultrahigh-density genetic maps (3 SNPs for a microsatellite)

Business model scenario	**InovWine**	
Existing rules	The electronic equipment must be discretely installed in the vineyards, in order to avoid theft The producers must pay their quotas in exchange for the services provided by the cooperative The producers are obliged to deliver all their production to ACC (it is common knowledge the existence of unapproved sales) The ACC's members must respect the cooperative statutes Grapes with more quality receive a higher payment by ACC. The quality depends on the wine degree and on biological properties of the grape (e.g., level of grey rot, acid rot, fermentative activity, and bacterial activity) The ACC only pays to its members when the wine is introduced in the market (it takes approximately two years) The new yeasts must respect the intrinsic characteristics of the Bairrada region wines The certified vineyards that were financed by the Portuguese State are obliged to produce for at least 5 years The inspection of base planting vineyards is made every 3 years The inspection of the grapevine nursery plantations is made every 6 months The grapevine nursery material is inspected in two phases: stick and plant The grapevine certification process assigns a label to a group of plants. This label follows a European standard and will not be replaced by other solution, at least in the near future A lost label cannot be replaced The Direcção Regional the Agricultura e Pescas controls 5% of the work developed by Viticert (based on a random choice) The grapevine certification follows the decree 194/2006 Each set of grapevines in the nurseries has a five digit code that identifies the material origin (the number of plants can vary by set)	
Available resources/actors	Certification process – Viticert Knowledge about the wine industry – ACC Resources to develop and commercialize new yeasts - ACC and Biocant Technological systems or products developed during the project – ACC/Biocant/IPN Database of grapevine genetic information and initial grapevine plant collection – Estação Vitivinícola da Bairrada Warnings about the treatments that should be applied in the vineyard – Meteorological station of Bairrada	
Institutional sanctions	Impose the penalties specified in the ACC statutes upon members that have deviated from the expected behavior	
Version: 0.3	**Date:** 29/12/2010	**Author:** Cristina Costa

Our interaction and close collaboration with the actors allowed us to draw their points of view, presented in Table 29 to Table 37, through the artifact "Actor description chart". Capturing their expectations is extremely important, since it provides us with further precision to check if they will achieve their aims through the InovWine business model envisioned in the proposal submitted to NSRF. All of the presented artifacts maintain the notation used above to fill in the data. We will start by describing ACC (Table 29).

Table 29: Adega Cooperativa de Cantanhede updated description

Actor's description	Adega Cooperativa de Cantanhede
Network interactions	Producers, Biocant, IPN, Meteorological Station of Bairrada
Relationships and flows	Receive grapes from the producers Pay grapes to producers Place the wine in the market Receive the payments of the clients Receive services from the InovWine information services (monitoring and automatic alarms) Receive services from Biocant (molecular characterization kit, microorganism identification test kit, identification of new yeasts) Receive warnings from the Meteorological Station of Bairrada Provide information (e.g., treatments to perform) and services to the producers (e.g., produces the wine)
Roles	Collect the producers grapes (the number of Kg delivered is estimated by weighing the transport vehicle loaded and empty, and obtaining the difference) Assess the grape quality through the wine scan (an electronic device that from a sample of the grape unveils its characteristics) Assign the value to the grape (based on their quality) payable to the producer. This is done at delivery Select the vessel (1, 2, or 3) where the grapes should be treated Advise the producers about the grapevines that suit each type of field Analyze the vineyard behavior through sporadic visits Provide information to producers (in person, by phone, by e-mail) to help them in their decision making on vineyard treatments (e.g., pruning, harvesting, fertilization) Provide formation sessions to its members Analyze historical data obtained through InovWine (e.g., the relationships among grape variety/ type of soil/climate/sanitary factors) Use the information obtained through InovWine to help producers in their decisions (e.g., choice of proper varieties based on the vineyard and climate characteristics, selection of more suitable treatments) Create new wines based on InovWine findings (ways to improve grape quality and identification of new yeasts) Explore the viability of new yeasts Promote the Bairrada wine and the Baga variety

Actor's description	**Adega Cooperativa de Cantanhede**	
Goals	Increase ACC's competitiveness and market reputation (presently, it has a quota of 2%) Contribute to the image of Portugal as an exporting country Contribute to Bairrada's social and economic development (e.g., creation of jobs) Identify and market new yeasts Promote the ACC's wines through the InovWine project Preserve the genetic heritage of the Bairrada's vineyards Modernize an industry that relies on traditional processes Improve the final quality of the existing wines and promote the development of new ones. There is a huge demand in the market for young wines. However, the baga variety is not widely appreciated when used in young wines. This variety needs to be made more attractive to the consumers of younger wines Identify the best grapevines to produce Bairrada wine Improve the detection of microorganisms (vineyards and wine) in due time Keep a monitoring and automatic alarm system for the vineyard that can be used by its members. It regards biotoc and abiotic factors Have a system for monitoring the grapevine life cycle. The insights obtained can reveal new ways to explore Portuguese Centro Region's conditions for wine production	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 30: Producers updated description

Actor's description	Producers	
Network interactions	ACC, Biocant, IPN, ~~Vitivinícolas Pierre Boyer (VVPB)~~, grapevine nurseries, Meteorological Station of Bairrada	
Relationships and flows	~~Insert information about each grapevine in the InovWine system to create a historical vine data set that can be used by the ACC and other producers~~ Insert information about areas of the vineyard in the InovWine system to create a historical data set that can be used by the ACC and other producers Receive information and services from the ACC Deliver grapes to the ACC Make use of services from InovWine Buy services from IPN and Biocant ~~Purchase garpevines implanted with RFID technology to VVPB~~ Buy grapevines from nurseryman (material and financial) Receive notifications from the Meteorological Station of Bairrada or from the ACC that must be followed in the vineyard treatment	
Roles	Buy grapevines Treat the vineyard (pruning, treatments, vintage) Insert data obtained from the vineyard's grapevines Use InovWine services (e.g., alarms, genetic identification) Purchase products developed by InovWine (e.g., kits, sensor networks)	
Goals	Increase the grape/wine quality through InovWine Increase the profit obtained with the vineyard Reduce the number of treatments applied to the vineyard Get guarantees on the genetic origin of the acquired grapevines Identify the best grape varieties that can potentiate their wine Keep a monitoring and warning system for the vineyard that supervises its evolution in real-time (e.g., react to pest situations, notice that a field is in water stress) Have a solution to access the grapevines history that can aid in the vineyard planning Receive support from the cooperative to use InovWine's devices and in interpreting their insights Enter data on the vineyard in the field	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 31: Biocant updated description

Actor's description	Biocant	
Network interactions	Producers, ACC	
Relationships and flows	Sell molecular characterization kits (producers, ACC, and nurseries) Sell microorganism identification test kits (producers, ACC, and nurseries) BOTH SERVICES MAY INVOLVE CONTRACTUAL ISSUES THAT SHOULD BE FURTHER DEVELOPED Provide after sale support to producers and grapevines nurseries using molecular characterization kits Provide after sale support to wine producers, and grapevines nurseries using microorganism identification test kits	
Roles	Sell molecular characterization kits Sell microorganism identification test kits (for the vineyard and the wine) Provide after sale support (SUBJECTED TO DISCUSSION) Promote kit development	
Goals	Sell kits and services developed during the project or get royalties through spin-offs	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 32: IPN-LIS updated description

Actor's description	IPN – LIS	
Network interactions	Producers, ACC	
Relationships and flows	Sell add-ons to the InovWine information system (producers and ACC) Provide maintenance of the InovWine application installed in the cooperative and of the client applications used by the producers. THIS SERVICE MAY INVOLVE CONTRACTUAL ISSUES THAT SHOULD BE FURTHER DEVELOPED	
Roles	Sell the client applications to producers that want to install InovWine in their vineyards Provide maintenance to InovWine applications Provide after sale support (SUBJECTED TO DISCUSSION)	
Goals	Sell the application developed during the project or get royalties through spin-offs	
Business model: InovWine	**Version and Date:** 03, 29/12/2010	**Author:** Cristina Costa

Table 33: IPN-LAS updated description

Actor's description	**IPN - LAS**	
Network interactions	• Producers, ACC	
Relationships and flows	• Sell wireless sensor networks and RFID technology (producers, and the ACC) • Provide the maintenance of the wireless sensor networks and of the RFIDs in the producers' fields. THIS SERVICE MAY INVOLVE CONTRACTUAL ISSUES THAT SHOULD BE FURTHER DEVELOPED	
Roles	• Sell wireless sensor networks and RFID solutions to producers that want to install InovWine solutions in their vineyards • Maintain wireless sensor network and RFIDs technology in the producers' fields • Provide after sale support (SUBJECTED TO DISCUSSION)	
Goals	• Sell the wireless sensor network and RFIDs solutions developed during the project or get royalties through spin-offs	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 34: Grapevine nursery updated description

Actor's description	~~**Viveiros vitivinícolas Pierre Boyer (VVPB)**~~ **Grapevine nursery**	
Network interactions	Producers, Viticert	
Relationships and flows	Sell grapevines to producers Provide services to aid producers in the selection of suitable grape varieties Offer after sale support to clarify how the grapevines should be treated	
Roles	Obtain the grapevines certification (if the nurseries belong to the Portuguese Western zone, this process is carried out by Viticert) Manage requests of grapevine varieties (in some cases, there is the need to acquire material for grafting from abroad) Advise the producers to make the best choice according to the characteristics of their vineyards (e.g., geographic location, type of soil) Make the grafts and put them in a germination chamber Produce the grapevine according to certified processes Assign a certification label to a set of grapevines Sell the grapevines Monitor the producers work in the field, to guarantee that the plants are properly treated	
Goals	~~Give credibility to the nurseries and to their products~~ ~~Create a record of the plants sold by the nurseries~~ ~~Ensure that the variety planted by the producer corresponds to the one requested in the nurseries~~ Increase profits by selling grapevines	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 35: InovWine system updated description

Actor's description	InovWine system	
Network interactions	ACC, Producers, IPN, Biocant	
Relationships and flows	~~Receive each grapevine's data from the producer~~ Receive vineyard (or set of grapevines) data from the producer Receive data from the wireless sensor networks and from the RFIDs Provide a service of monitoring and automatic alarms for the vineyard (producers and the ACC) Provide the access to a grapevine and vineyard's historical data set (producers and the ACC) Receive data from the molecular characterization kits (producers and the nurseries) Receive data from microorganism identification test kits (ACC, producers, and nurseries) Is maintained by IPN and Biocant (SUBJECTED TO DISCUSSION)	
Roles	~~Create a grapevine historical data set (full life cycle)~~ ~~Ensure the grapevine origin~~ Create a historical data set of the vineyard, and of grapevines that have an associated RFID (it should include the information obtained with the kits) Provide a monitoring and warning system for the vineyard, permitting its supervision and evolution in real-time (it should include voice alarms) Record and update the Bairrada genetic heritage	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 36: Meteorological Station of Bairrada updated description

Actor's description	Meteorological Station of Bairrada	
Network interactions	ACC, producers	
Relationships and flows	Issue warning services for the ACC and some of its members that subscribe this service for a charge COOPERATE WITH ACC TO EMIT WARNINGS ADJUSTED TO THE BAIRRADA SPECIFIC CONDITIONS	
Roles	Issue warnings to aid in the vineyard treatment	
Goals	Enhance the precision of the treatment warnings Increase the profit obtained with its activities of collecting and processing meteorological data	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

Table 37: Major producer updated description

Actor's description	Major producer	
Network interactions	IPN, BIOCANT	
Relationships and flows	ACQUIRE THE COMPLETE INOVWINE SOLUTION OR SPECIFIC FEATURES COOPERATE WITH IPN AND BIOCANT TO REFINE THE INOVWINE SOLUTION	
Roles	BUY INOVWINE SERVICES (E.G., MOTORING AND WARNING SYSTEM, THE RFID SYSTEM TO OBTAIN GRAPEVINES RECORDS, OR THE MOLECULAR CHARACTERIZATION KITS)	
Goals	INCREASE THE QUALITY OF THE WINE AND IMPROVE THE VINEYARDS PRODUCTIVITY	
Business model: InovWine	**Version and Date:** 0.3, 29/12/2010	**Author:** Cristina Costa

To keep track of developments in *Phase I*, we updated the above supporting artifacts ("Networked business model description chart" in Table 28 and the "Actor description charts" from Table 29 to Table 37) with all unknown aspects revealed. Supported by the actors' feedback, we combined the previously identified details of the proposal submitted to NSRF with the vision of each actor for the post project phase along with inputs from the business model in use prior to InovWine project. The information collected exemplifies how we used the steps of *Phase I* of BIZ2BIS to broaden our understanding on the business model described in the proposal submitted to NSRF and on the context of the wine sector in the Bairrada region.

The complementary viewpoints gathered in *Phase I* and the developed awareness enhanced our sensitivity to detect glitches and flaws. We perceived that the producers did not have financial means to invest in the system and that the use of RFIDs could be at risk for the same reason. Its use would imply an increase in roughly 50% of the grapevine cost, which would aggravate the already difficult economic situation of the producers. Due to the impact of the disclosed issues and the possible need to undergo adjustments in the conceived business model, we changed the typical sequence of BIZ2BIS. We moved on to *Phase II*, *Step II.d "Description of critical dependencies"* to detail the detected threats and their implications. Then, we applied *Phase II*, *Step II.c "Negotiation of actor contributions"* to find potential solutions that could minimize the detected menaces. Both steps allowed us to discover more into the business model and suggest eventual amendments. In the following section, we will discuss minutely how we employed these two steps.

7.2.2 Phase II, Step II.d, II.c –Identification of weaknesses in the proposal

In the proposal submitted to NSRF it was assumed that the ACC's members would collaborate in a set of activities defined in the InovWine proposal in order to improve the vineyard treatments management and the grape quality. At the end of the project, it was expected that each producer would buy devices (for instance, wireless sensor networks, smartphones, or molecular characterization kits) to install the InovWine solution in their own fields and use a set of services.

Some of the identified services were: access to historical data, guarantee of grapevine origin, as well as a monitoring system to issue automatic warnings and assist vineyard treatment decisions.

Producers clearly recognized the advantages of enhancing their grape quality, since the payment of their products is based on this factor. However, despite that interest, there are limitations that can put their participation at risk. As described in Table 28 (field "Shared interpretations and representations"), contrary to what was initially foreseen in the proposal submitted to NSRF, the majority of the ACC's members do not possess the required financial conditions to install InovWine devices in their vineyards. The sentence "We do not have enough money for regular expenses, let alone additional ones" is frequently heard among the producers, which illustrates their unwillingness towards extra spending. Everything becomes even more complicated when these acquisitions encompass technological equipment, since the majority of the cooperative producers lack related skills, and have a low awareness of its potential (Table 28, field "Shared interpretations and representations"). The financial effort demanded on producers plus their technological illiteracy can seriously undermine their participation in the InovWine business model and, consequently, the stability of its network of actors.

By applying *Phase II*, *Step II.d "Description of critical dependencies",* we exposed the difficulties that the Bairrada context imposes on the adoption of the InovWine business model in the "Dependency diagram" (Figure 45). Through this diagram, it is possible to observe that the activity of inserting grapevine and vineyard data depends on: the financial capacity of the producers to acquire technological devices, their technological skills, and their personal motivation to enter data (insights obtained in the steps of *Phase I*). However, if the information that depends on the producers does not exist (situation marked by the red "X"), it will not be possible to create records of the vineyards behavior (jeopardizing the opportunities identified in *Step I.a "Exploration of the business model"* in the "Networked business model description chart", Table 28). This lack of data from each producer hinders their ability to receive personalized warnings and statistics. As a consequence, two InovWine value propositions that are of extreme interest to the majority of actors (ACC, producers, Biocant, and IPN) were threatened. These are: "Improve the quality of the ACC wine through InovWine" and "Improve the productivity of the ACC wine through InovWine". We perceived these value propositions when analyzing the goals identified for each actor in the artifacts "Actor description chart" (field "goals" from Table 29 to Table 37). Without the producers' data, their goals can be seriously at stake, the actors will unlikely achieve an alignment of their interests, they will not be enrolled, and they will demobilize, reinforcing the suspicion that the networked business model may collapse.

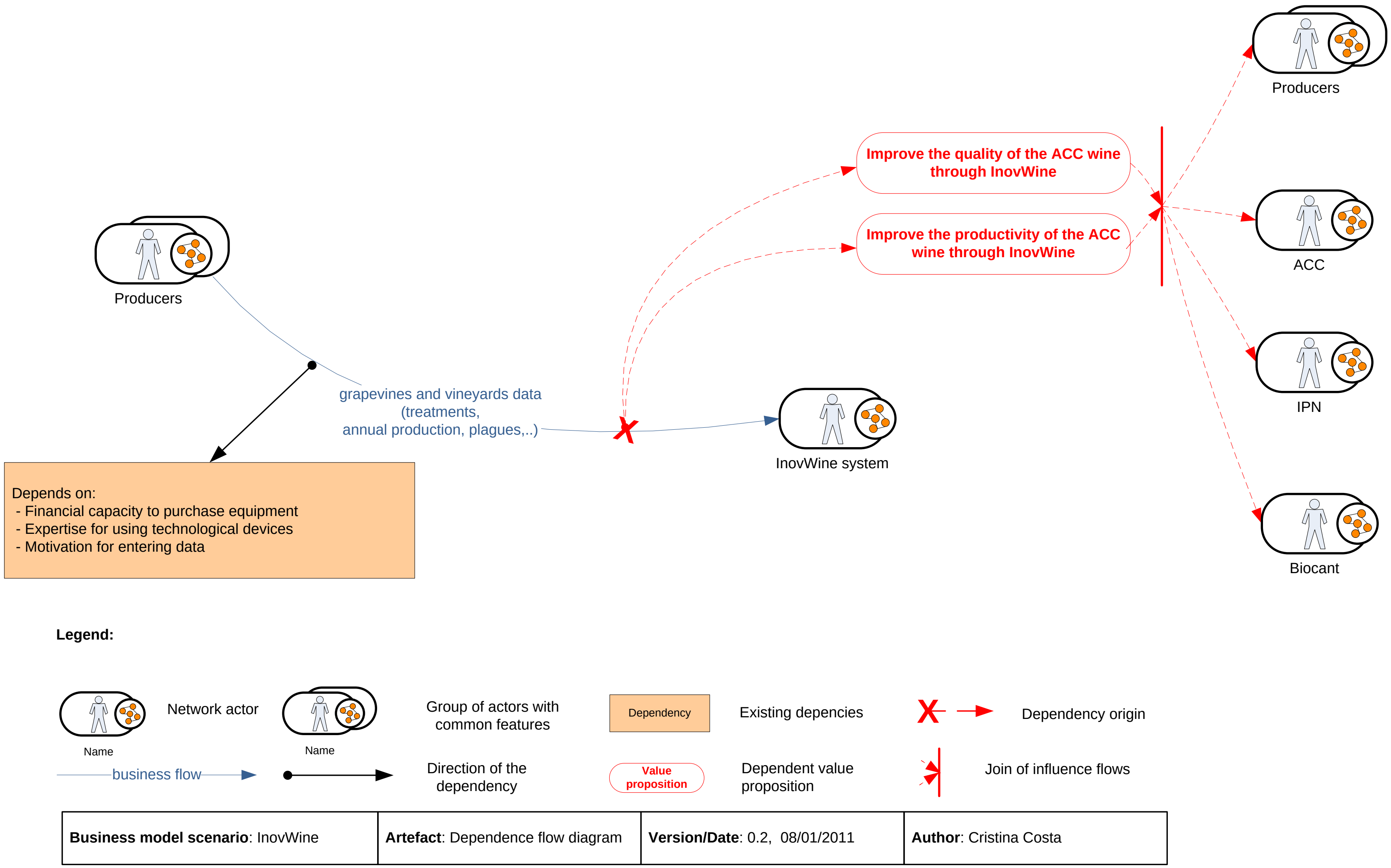
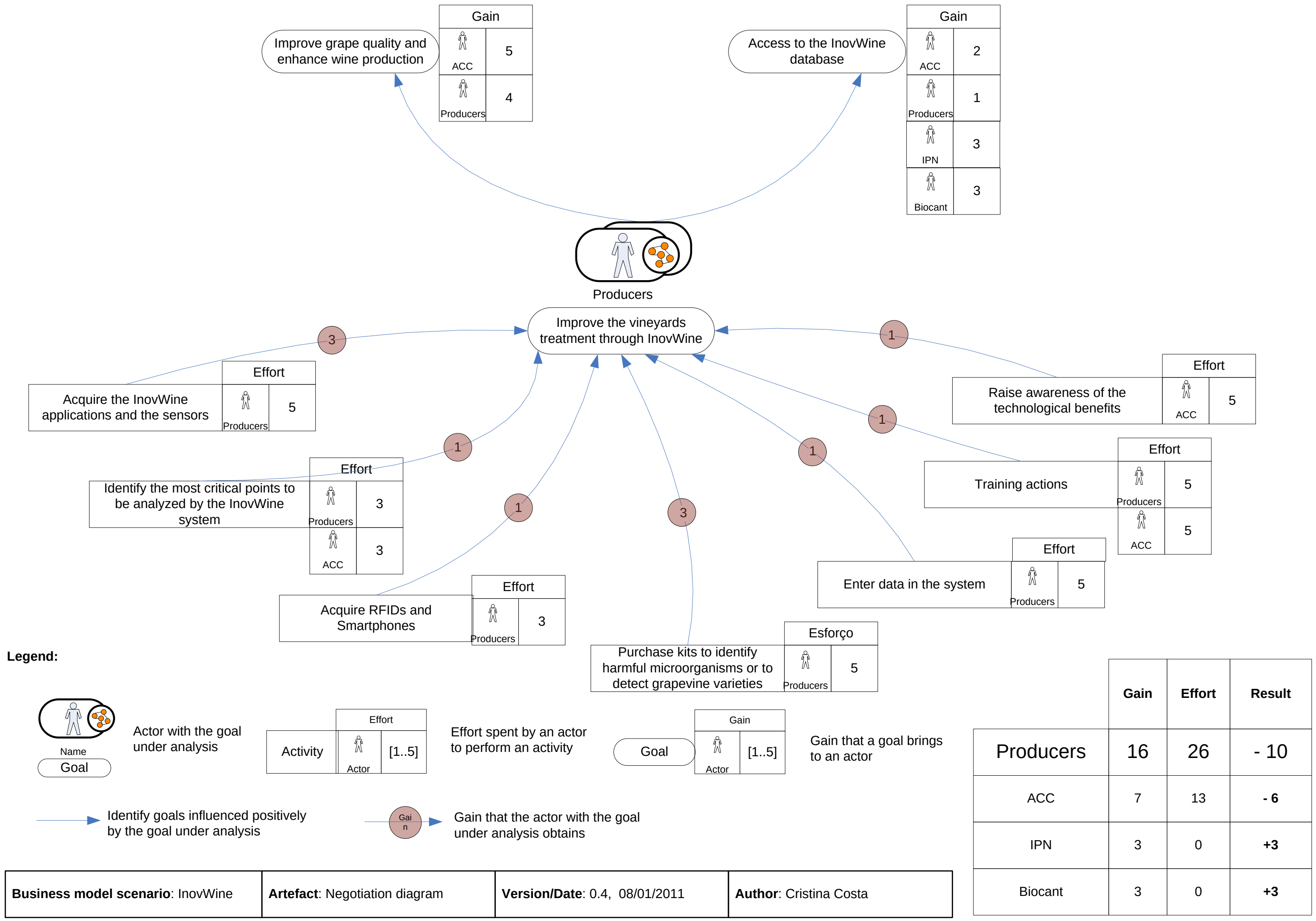


Figure 45: Dependency diagram for the information flows to be entered by the producers

Taking into account the unstable nature of the aforementioned scenario and the negative impact that the unachieved expectations would have on the actors, we decided to employ *Phase II*, *Step II.c "Negotiation of actor contributions"* to analyze potential critical goals. We sought clues for their identification in *Phase I* supporting artifacts ("Networked business model description chart", Table 28, and "Actor description charts" from Table 29 to Table 37). A strong goal that attracted us was "Improve the vineyards treatment through InovWine system". We supported our option by its direct exposure to failure when the producers do not enter data. In addition, the majority of the actors considered it crucial. Moreover, it is supported by activities that can also be at risk (e.g., the acquisition of devices) and it is related to several other goals with influence on the network overarching aims (e.g., quality and production issues). To better understand the goal and its impact on all involved actors, we detailed it in *Step II.c*' "Negotiation diagram" (Figure 46), which balances aims in terms of gain and effort.

To estimate the values placed in the diagram, we relied on the actors' perspectives with impact on, or influenced by, this goal (information mainly gathered in *Phase I*). First, we considered what the ACC's producers get without resorting to the InovWine system services and then what they gain as an extra when they use it - this extra gain is the InovWine contribution to the goal. The effort, in turn, is the additional exertion that the producers must carry out to support the goal. Furthermore, we also considered in our assessment the specificities of the business model context. For instance, as the producers own small parcels of land, they have huge space restrictions that hinder the implementation of experiments to promote the quality of the grapevines. Even if the InovWine system would be able to identify the best grapevines in a vineyard, this insight would hardly be used because the majority of producers lack space to plant a new vineyard with grafts from these singular grapevines. In addition, the producers are always able to sell their grape production to the cooperative, independently of owning, or not, certified grapevines, or of using, or not, InovWine services ("Networked business model description chart" in Table 28, field "Shared interpretations").

Now we will look in detail at the diagram to disclose and perceive the values assigned. On the one hand, we can see that the acquisition of electronic equipment demands huge efforts (rectangles adjacent to the activities and to the actors that carry them out in the lower part of the diagram). This is also apparent for activities of data insertion and technological training. On the other hand, gains are achieved with this goal at two levels: the ones that the producers get from the actors that perform the supporting activities of the goal (in the red circles) and the ones obtained from actors that directly benefit from the goal achievement (in the rectangles adjacent to the actors, mainly producers and the ACC, in the upper part of the diagram). We can see in the diagram a deep imbalance between, on the one hand the acquisition of equipment, data entry, and technological training, and on the other hand the benefits obtained with the quality and productivity enhancement. We present the summary of this assessment at the bottom right hand corner of the diagram. They allowed us to note that the effort exerted by the producers and by the cooperative is greater than the gains obtained. Further loss is evident for the producers. In fact, the effort required from them is so demanding that clearly puts their participation in question.



	Gain	Effort	Result
Producers	16	26	- 10
ACC	7	13	**- 6**
IPN	3	0	**+3**
Biocant	3	0	**+3**

Figure 46: "Improve the vineyards treatment through InovWine" negotiation diagram

The results in the "Negotiation diagram" (Figure 46) gave us clear indications that the goal "Improve the vineyards treatment using the InovWine system" would be unfeasible if each actor would have to buy his/her own solution (client application, smartphones, RFIDs, wireless sensor networks, molecular characterization kits, and microorganism identification test kits). In addition, due to the social, cultural, and economic context of the cooperative, it would be very hard for its members to implement and exploit all the possibilities that this technology can provide. To complicate matters further, funds that have been assigned to the wine industry in the recent years (by state funds or European programs) will probably end due to the current financial crisis, emphasizing the existing economic problems. As the producers have no other substantial gains from the business model beyond those identified, it becomes very difficult for them to adhere to it. Nevertheless, as shown in the "Actor description charts" from Table 29 to Table 37 (*Phase I*, *Step I.b "Description of participating actors"*) the InovWine system is able to meet the producers and the ACC expectations.

To minimize the exertion made by the producers and fight the pointed out difficulties, we identified a set of proposals that can be put in action. For instance, at a financial level, the cooperative can try to organize collective and larger scale purchases of equipment, in order to obtain reduced prices. At a pedagogic level, to decrease the difficulty of the producers in resorting to technology, the cooperative can promote training actions to decrease technological illiteracy and initiatives to raise awareness of the benefits achieved through technology, as well as organize meetings to facilitate the use of the InovWine system. However, when analyzing the Bairrada context, it is possible to perceive that these actions will be extremely laborious and exhausting, greatly increasing the effort expanded by the cooperative: many of the producers see the vineyard as a hobby, are not prepared to make additional endeavors, and their older age imposes some resistance to change. The InovWine technological team can also contribute to minimize this resistance and motivate the commitment of the producers. By giving special attention to their needs in the user interface design, it is possible to enhance the system usability that, hopefully, will incite their participation.

To convince the actors to adopt the InovWine business model, we also decided to show them its added value, when compared to the already existing systems of warnings. Through the study of the business model prior to InovWine Project (*Phase I*), we noticed that the Meteorological Station of Bairrada releases guidelines concerning the vineyards treatments on the Internet, for free, approximately every three months. This organization also provides urgent warnings online, but with very short notice and without the precision aimed by the InovWine system, since its equipment is dispersed and does not regard the particular characteristics of each field. Alternatively, the meteorological station also offers an additional service where, for a fee, its subscribers receive the warnings in advance. However, the producers neither access the Internet nor subscribe to the service. Since the cooperative is one of the meteorological station subscribers, they prefer to wait and be warned by the cooperative technicians, who may not always be available. Not only does this behavior underline the restricted technological skills and the limited financial capacity of the producers, but also the fact that most of the times they do not receive the notifications on time. The identified communication delays, which can serious jeopardize the grapevine production, can be exploited in favor of the InovWine business model.

Besides the difficulties detected around the goal “Improve the vineyard treatments using the InovWine system”, the information gathered in *Phase I* allowed us to detect another problematic situation, this time related to the use of the RFID technology. One of the main goals of the InovWine proposal submitted to NSRF was to implant an RFID in each grapevine in the nurseries. By implanting an RFID in a plant the InovWine system would be able to provide an additional guarantee of the grapevine genetic origin, preventing forgery and corruption. Furthermore, it would have the advantage of enabling the tracking of each plant’s life cycle. However, the RFID value is relatively half the price of the grapevine (this information was given by the VVPB and confirmed by Viticert), which would imply an increase in the producers’ expenses of approximately 50%, see “Networked business model description chart” in Table 28 (field “Shared interpretations and representations”).

In order to guarantee the authentication of the grapevine variety, the RFIDs would have to be placed during the grafting phase. Since there is a 50% loss in the nurseries production, this implies that there will also be a 50% loss in RFIDs, boosting the cost of the grapevine even further. Based on our interviews, we perceived that the business actors recognized the importance of assuring the plants origin, but neither the producers nor the ACC showed willingness to support this extra cost. The possibility to track grapevines in the fields, one by one, through RFIDs, was also not very appealing for most of the producers (Table 28, field “Shared interpretations and representations”). In addition to its financial cost, it demands a huge effort to manually insert data. In the producers opinion, since grapevine rows and field patches possess similar characteristics (e.g., same variety and soil type), all that would be necessary would be to use an RFID analysis in a row by row, or a patch by patch basis (Table 28, field “Mutual obligations and expectations”).

Besides the financial issues and the lack of motivation to insert data, there are additional problems in the RFIDs adoption. Portugal already has a certification system that respects the European legislation. This certification process follows a set of well establish rules (Table 28, field “Existing rules”), with rigorous quality tests that provide the producers reasonable guarantees on the grapevines genetic origin.

In spite of the general acknowledgment of the present certification process validity, some of its procedures can unintentionally introduce errors in the grapevines classification. For instance, it encompasses a visual component of analysis based on morphological descriptors (ampelography) that compares shape and color of the grapevine leaves, buds, and grapes. Only specialists can perform this classification, since some plants are almost impossible to categorize (e.g., young plants still do not exhibit the typical morphological features of adult plants). Nonetheless, this expertise is confined to a restricted number of experts who, along the years, have been diminishing, due to the amount of skilled people who have reached retirement age (Table 28, field “Shared interpretations and representations”). Besides the classification difficulties, the nurseries deal with thousands of bud sticks and grafts, which can lead to additional errors.

The molecular characterization kit under development by Biocant (based on DNA markers) will provide a reliable classification of the grapevines. Its results could be recorded in RFIDs and implanted in the corresponding grapevine. However, despite the benefits RFIDs could bring to the certification process, the current legislation does not account for the use of these devices.

It is worth pointing out that is not viable to expect that the certification process will be changed in a short term, since it is widely implemented in the wine sector and it has a strong legal background. At best, it can only be complemented with additional features. Given this restriction, the combination of the RFIDs with the kits can only be used as an additional method to strengthen the existing certification process. For this reason, the goal "Develop a genotyping system based on molecular methods to aid in the grapevine certification" presented in the proposal submitted to NSRF, should be changed to "Develop a genotyping system based on molecular methods to complement grapevine certification".

The use of RFIDs as initially described in the proposal submitted to NSRF might be an interesting opportunity to explore in the near future, especially if the liable parties decide that alternative classification mechanisms are needed. They may decide, for instance, that the labels currently used to identify the variety classification of a set of grapevines do not answer to all the necessary security requirements (they are made of paper, and easily destroyed or falsified), see Table 28 (field "Shared interpretations and representations"). As an alternative, they may promote the use of an RFID per grapevine, or, similarly to the existing labels, they may assent in assigning an RFID to a set of grapevines (e.g., an RFID would be associated with a set of fifty grapevines, reducing the cost of its application).

We did not use a "Negotiation diagram" to analyze the viability of using RFIDs to individually characterize each grapevine because of legal impediments and lack of interest from actors. In general, most producers prefer to negotiate with nurseries that they have come to depend on, and in whom they trust. Due to their own knowledge in the field, the majority can also complement this trust with their capacity to perform a visual analysis of the grapevines, obtaining an additional assurance regarding their purchase.

7.2.3 Findings after the first BIZ2BIS iteration

The information collected about the business model described in the proposal submitted to NSRF allowed us to perform a thorough reflection that took into account the context of the cooperative and the expectations of its producers. The findings gave us the chance to draw some conclusions on topics that could endanger the interessement and enrolment of the network actors in the idealized business model. The actors with the power to make decisions should use our outcome, presented below, as a basis for future adjustments:

- Most cooperative members have very limited financial resources. They do not possess monetary capacity to acquire their own wireless sensor network. Even less expensive devices that support InovWine features like smartphones, will only be acquired if the producers strongly believe that they can bring them indisputable benefits.

- Producers are not willing to pay more to obtain an additional assurance about the grapevines' genetic origin. The majority of them usually trust the nurseries that they have come to depend on.
- Producers' lack of technological skills limits their interest, motivation, and ability to adopt the InovWine business model.
- The notifications issued by the Meteorological Station of Bairrada frequently do not reach the producers on time. Since this information is critical to these actors, the detected inefficiencies can be exploited by the InovWine information system to encourage their participation and transform the InovWine alarms in a fundamental resource in their activities.
- Producers do not consider it to be worthwhile to have individual records per grapevine. According to the obtained opinions, the return of the introduction of an RFID per grapevine does not counterbalance the financial costs involved and the effort to insert data per grapevine. In the producers' opinion, it is more appealing to identify areas (e.g., rows or patches) with similar characteristics and analogous behaviors and to assign it a common RFID. Their lack of interest led us to reconsider how RFIDs should be used.
- The implantation of the current certification process and its legal support (it follows European rules), as well as the increased costs associated with the use of RFIDs, prevents the development of an alternative certification system based on this technology. However, when combined with biological research (e.g., DNA markers), RFIDs can bring apparent advantages to the classification process. For this reason, it would be advisable to explore it, since its restrictive factors can change drastically in the near future (e.g., new laws, or lower prices), opening up new windows of opportunity.
- Some actors identified in *Phase I* are not relevant to the new version of the InovWine business model. With the inability to integrate the RFID and the Biocant's kit in the current certification process, the relationships with grapevine nurseries, Viticert, and the Instituto Superior de Agronomia became out of scope of our study. These relationships will remain unchanged, before and after the adoption of the envisaged business model. Furthermore, since the RFIDs will not be introduced in the VVPB nurseries (as initially planned) there is no longer the need to associate the business model with that particular nursery. The producers can purchase their grapevines from whoever they want and the business model will no longer cover such activities.
- The InovWine business model does not consider the role of wine consumers. Although it intends to provide high quality wines and increase the ACC income, it does not have as its aim to analyze the relationship between ACC and its customers.

We presented the above findings to the actors responsible for the InovWine project (ACC, the producers, Biocant, and IPN). They took into account our warnings and were receptive to our proposals to minimize the identified issues. The detected financial problems revealed to be one of the greatest drawbacks of the business model: producers had no disposal income to buy the required equipment. Since the wireless sensor networks that each producer was expected to purchase was crucial for picking up the abiotic data that would enable the issue of warnings, we proposed an alternative to the acquisition of individual networks - the creation of a common network of sensors supported by the project funds. This single expanded network of a larger mesh would cover the land of all the cooperative members. To implement this idea on the ground, it was necessary to identify the areas that best characterize the region, in particular their critical points, in order to obtain a typical sample of that region's abiotic data. For this identification, we appealed to ACC. Its expertise on the wine sector and knowledge of the terrain offered us guarantees about the representativeness of the selected locations for sensor implantation.

Clear benefits can be obtained by complementing the abiotic data collected by the network with data inserted by the producers in real time at the vineyard. For this to happen, they must buy smartphones and use them to enter specific data about their grapevines in the InovWine information system. As a result, the alarms received by these producers will regard particular characteristics of their lands (abiotic and biotic data) and will be able to best suit their needs. Based on our findings, the use of an RFID per grapevine was disregarded. However, we recommended to the producers to use RFIDs as an add-on and implant them in representative or critical points of their fields. By inserting relevant data to the plant characterization they can keep track of them and maximize the use of the smartphones.

As aforementioned, many of the ACC members have apparent difficulties in using technology (e.g., accessing a website or reading a text message in a mobile phone). Given this limitation, we suggested that the InovWine information system should not only send text messages (e.g., to the smartphone or by e-mail), but also send out voice messages. If users are not available to listen to the warning at the time of the established contact (e.g. don't answer the phone or hang up), a retry should happen later, according to a time range defined. Based on the information gathered in interviews, we are confident that the phone calls will stimulate and increase the producers' willingness of using InovWine services, since it is based on a use of the equipment that is familiar to them. In addition, the cooperative must develop actions to minimize technological illiteracy and support the participation of the producers (e.g., promote InovWine system training actions or other initiatives able to raise awareness to technological benefits).

The solution designed allows different configurations that the producers may choose to best fit their needs and budget. They can acquire all the devices simultaneously, or they can progressively develop their solutions. For example, they can initially buy a smartphone and a set of RFIDs, and, at a later stage, they can enhance their solution by installing their own wireless sensor network. The tendency of these devices to get cheaper can also favor this type of approach. Even in the worst-case scenario – the producers that do not purchase any device – an extrapolation can be made based on the common wireless network data and on the information entered by the producers of the surrounding fields. Obviously, the warning specificity for the non-equipped producers will be lower, but greater than the general notifications provided by the Meteorological Station of Bairrada.

The analysis we carried out so far led us to propose significant changes to the InovWine business model and underlying technological support. However, we must also analyze the viability of the updated version that we proposed. To that effect, we initiated a second iteration of BIZ2BIS. Due to the importance that the producers possess and the detected problems around their participation, one of our biggest concerns in this new iteration was to ensure their access to the benefits offered by the InovWine system at a reduced cost. We wanted to avoid obstacles and disappointments that could lead to their demobilization and consequently to the network collapse. Therefore, we tried to create favorable conditions to promote their participation.

Throughout the first iteration of BIZ2BIS, in cooperation with the remaining actors, we detected problems, made decisions, and proposed solutions. This resulted in changes and revisions that we steadily updated in the supporting artifacts of the first two steps of *Phase I*, which allowed us to directly advance to *Phase II*. We will detail its process in the following sections.

7.2.4 Phase II, Step II.a – Dependencies in the redesigned business model

When we no longer detected problems in the InovWine business model, we employed *Phase II*, *Step II.a "Detection of dependencies among goals"* to disclose how one goal could influence others and contribute to the overarching purpose of the InovWine business model (identified in the "Networked business model description chart", Table 28, field "Network goals"). The data we collected in *Phase I* of BIZ2BIS was our main source of information for this step. In spite of the available information, when depicting the dependencies among the actors' goals using *Step II.a* "Common goal diagram", we felt the need to establish additional contacts with the actors (interviews, phone calls, and emails) to clarify minor details. Whenever we discovered new information about the business model and its actors, we moved on to *Phase I* to update its supporting artifacts with the obtained findings. Then, we returned to *Phase II*, *Step II.a* to complete the "Common goal diagram". We present its last version in Figure 47.

By exposing dependencies among the goals of each actor, we explored synergies (e.g., cooperation among actors) and disclosed potentially hazardous situations (e.g., the implications of an actor desertion). For example, on observing the "Common goal diagram", we can see that the goal "Produce top quality grapes" is supported by the accomplishment of the following goals: "Sell molecular characterization kits and provide their supporting services", "Sell microorganism identification kits (wine and grapevines) and provide their supporting services", and "Improve vineyard treatment using InovWine system". On the other hand, it contributes itself to the achievement of the ACC's goals: "Create new wines" and "Enhance the quality of the produced wine". The last two, in turn, support the network's ultimate goal. The described entanglement of goals shows the close relationship that exists between the ACC and its producers, and how they can cooperate to achieve common aspirations. In addition, it also reveals that Biocant can have an important role to play in the creation of new and enhanced wines and that its ties with the ACC should be promoted.

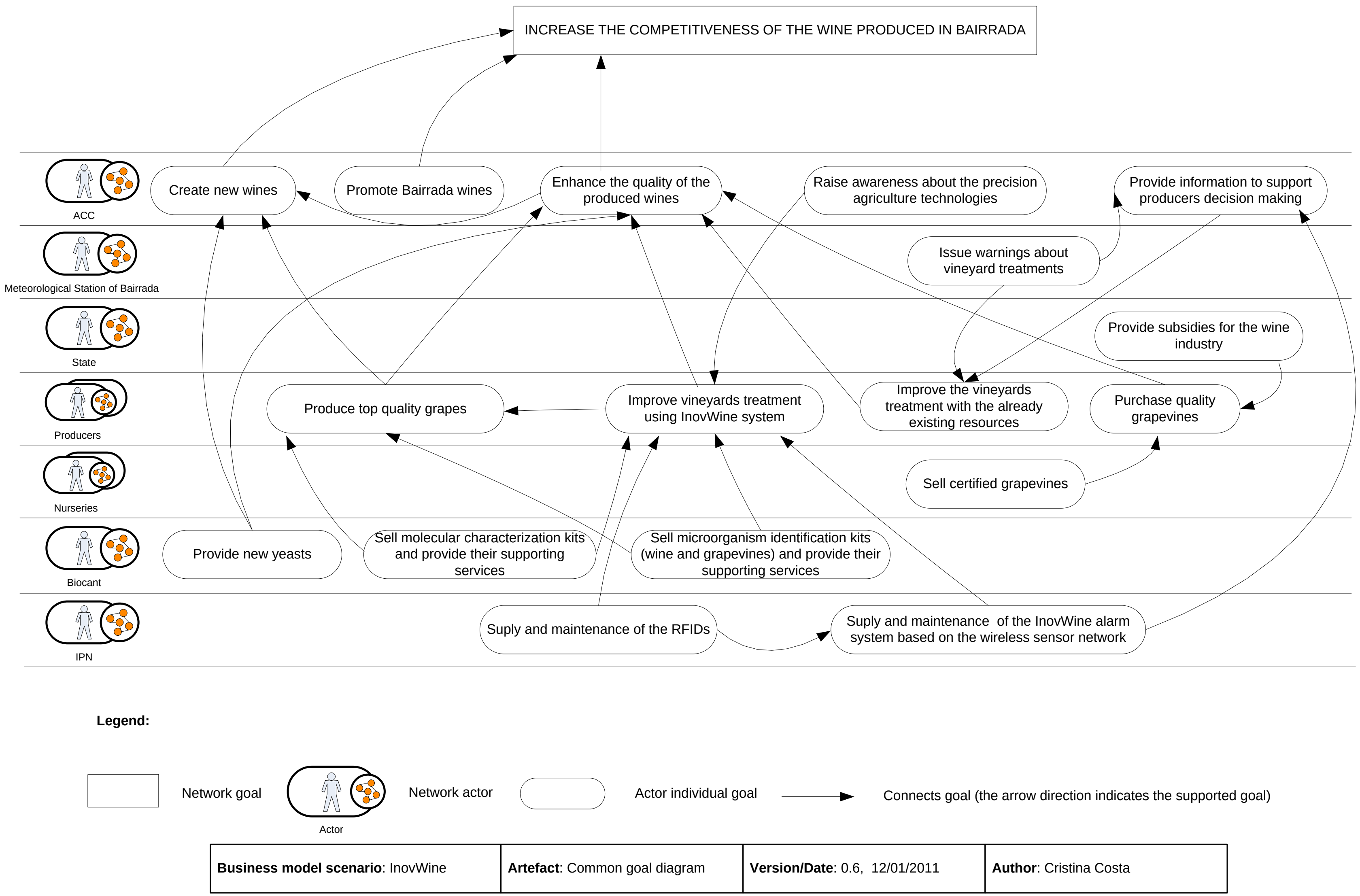


Figure 47: InovWine Common goal diagram

We also used the "Common goal diagram" to disclose challenging objectives. To exemplify, we will focus on the goal "Improve vineyards treatment using InovWine system". The number of dependencies established around it is far superior to those of others (it implicates various goals and its accomplishment relies on several actors), denoting its key role in the business model. This emphasis is entirely justified by the importance assigned to goals addressing the enhancement of the vineyard treatment. However, the complexity inherent to its supporting activities may endanger its achievement and consequently jeopardize the networked business model. As can be seen, this goal is critical to achieve relevant purposes for the actors ("Actor description charts", from Table 29 to Table 37). It contributes towards the improvement of the grape quality and, thus, to the wine excellence, as well as to the creation of new products. Together, these dependencies form a network of interactions that supports the ultimate business model objective: "Increasing the competitiveness of the Bairrada wine". Besides the implications of the goal under study on other goals, its accomplishment relies on the contributions of several actors (e.g., Biocant, IPN, and the ACC), and requires their close collaboration. All these dependencies and implications made of it a prime target of assessment.

The goal "Enhance the quality of the produced wine" is also decisive to the business model. As a matter of fact, it assembles many of the expectations of the actors that are more involved in the business model. Improving the wine quality will enable the creation of new and enhanced wines that will strengthen the current position of the ACC in the market and increase its competitiveness. An external recognition of its products will augment its prestige, adding value to the producers' grapes. A success at this level would increase the producers' negotiation power. Contrary to the achievement of the goal "Improve vineyards treatment using InovWine system", which technologically depends essentially on the InovWine information system (and thus from IPN outcomes), this one also depends on the research results of Biocant. By its described impact on the business model, we will also evaluate the goal "Enhance the quality of the produced wine". According to the information gathered in the previous steps, BIZ2BIS did not provide indications that justified a more detailed analysis of the remaining goals. They did not have many dependencies, the activities that support them had no know threat, and they did not raise issues or problems that made them crucial for the business model. Next, we will advance to *Step II.b "Identification of actor affinities"* to take a closer look into the goals of each actor, identify shared interests, and explore prospects to strengthen the network.

7.2.5 Phase II, Step II.b – Identification of actor affinities

Step II.b helped us to perceive how actors could be involved in partnerships, and aided us to position them in the business model (for instance, it showed us the number of objectives that each actor possessed and the number of actors that shared a same goal). We used the "Actors/Goals affinity chart" (Table 38) to list the goals of each actor and identify the shared ones. To fill in this chart we used the information available in the "Networked business model description chart" (Table 28) and the "Actor description charts" (from Table 29 to Table 37).

Table 38: InovWine Actors/Goals affinity chart

Actors / Goals	Use a vineyard monitoring system able to generate automatic treatment alerts	Improve the wine quality and productivity through InovWine	Access the vineyards/grapevines history	Detect fungi in vineyards in due time	Increase the competitiveness of the ACC wine	Sell products and services developed during the project or get royalties through spin-offs	Promote the ACC wines through the InovWine	Enhance the precision of current treatment warnings	Increase the profit on the vineyard	Increase Portugal exporting rate	Identify and protect the Bairrada genetic heritage	Identify the best grapevines to produce wine in the Bairrada	Create new wines using the best quality grapes and new yeasts	Increase profits by selling vegetative material	Improve the detection of harmful microorganisms in the wine that can deteriorate it	**Total amount**
ACC	X	X	X	X	X	X	X	X	X	X	X	X	X		X	**14**
Producers	X	X	X	X	X		X	X	X		X	X	X			**11**
Biocant	X	X	X			X										**4**
IPN	X	X	X			X										**4**
State					X		X			X						**3**
Nurseries				X										X		**2**
Meteorological Station of Bairrada								X								**1**
Total amount	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	
Business model: InovWine	**Version and Date:** 0.4, 15/01/2011									**Author:** Cristina Costa						

We can see through the “Actors/Goals affinity chart” that the ACC and the producers aspire to accomplish more goals than the remaining actors (respectively 13 and 9). These results are consistent with our expectations. On the one hand, the ACC, in its role of main promoter of the project, had the chance to shape the InovWine business model according to its own interests in the wine industry. On the other hand, since the producers are ACC members and have interests in common with the cooperative, we were already predicting that they also intended to achieve a large number of goals under the scope of the InovWine business model. In fact, in most cases, the goals of the producers are shared with ACC. For instance, “Use a vineyard monitoring system able to generate automatic treatment alerts”, “Access the vineyards/grapevines history”, and “Detect fungi in vineyards in due time”. Exposing and detailing the affinities between ACC and its members reinforced our idea that these actors have been working in collaboration (or at least have depending on each other), even before InovWine. Both actors clearly will benefit from keeping and extending this cooperation: if producers grow quality grapes, the ACC has higher chances in improving its wine, gets better profit, and obtains assets that could allow it to reinforce their activities in favor of the producers. The InovWine business model articulates interrelated activities and foments new opportunities and goals that can be extremely advantageous to exploit.

After the InovWine project ends, IPN and Biocant can remain in the InovWine business model as entities that provide services or products (e.g., maintenance of software and equipment, as well as supply of laboratory tests). Alternatively, these actors can promote the creation of spin-offs that will replace them. In both cases, their presence in the business model will be mainly driven by commercial purposes, and they will no longer be involved in grape production and wine-making activities. Furthermore, we would like to note that the products and services developed by these two technological centers, as well as the acquired knowledge, can be sold or applied on other scenarios, beyond the cooperative. The share of royalties will be decided according to the project agreement on intellectual property. The mentioned common research interests and commercial purposes show another cluster of affinity in the “Actors/Goals affinity chart”, this time between IPN and Biocant.

It is also interesting to notice the role of the Portuguese State in the chart. This actor has been sponsoring, in cooperation with the European Community, several programs to stimulate the Portuguese wine industry. In return, it expects to enhance its competitiveness (in this particular case of the Bairrada Demarcated Region) and increase the exporting rate of the country. This investment shows the importance of the wine sector and reflects the concerns of the Portuguese State to achieve a goal that goes beyond the cooperative range: stimulating the Portuguese economy.

Grapevine nurseries and the Meteorological Station of Bairrada are also addressed in the “Actors/Goals affinity chart”. We can observe that the first has two goals while the second has one. Nurseries intend to “Detect fungi in vineyards in due time” and “Increase profits by selling vegetative material”, while the station aims at “Enhance the precision of current treatment warnings”. These numbers are not surprising, since these two actors possess a restricted scope in the InovWine business model. They provide specific services to the ACC and to its members, and although these services influence the wine production, they are not directly related to the main purposes of the InovWine business model. Despite the reduced expectations of the grapevine nurseries and the Meteorological Station of Bairrada, BIZ2BIS pointed out the existence of synergies that the cooperative can explore with these two actors. For instance, since the station has interest in accessing weather data (to the point of actually paying for it, “Networked business model description chart”, Table 28), the data acquired by the shared wireless sensor network that will be installed in fields of the cooperative’s members can be used to encourage its participation in the InovWine project. In addition, it can be useful for the meteorological station to integrate the results obtained through InovWine biological analysis in its studies, as well as data obtained by InovWine sensors that the station does not have at its disposal. This would allow the station to enhance its warnings and contribute to improve the productivity in the region, which would be particularly useful until the warning system would be fully tuned. With respect to nurseries, they can establish collaborations with Biocant and IPN if changes in the grapevines’ certification process take place. For example, if the European governments start to consider the use of the RFID technology, the two technological centers and the nurseries could be partners in developing a new certification system. They could adopt a solution similar to the one initially submitted to NSRF. They could use molecular methods to provide the exact identification of the genetics of the vegetative material, which could subsequently be recorded in RFIDs and implanted in each grapevine (or in a group, for economical reasons). Furthermore, the kit that Biocant will develop to early detect fungi in grapevines can also be extremely useful in nurseries, which have to fight these types of threats on a daily basis, with a huge economic effort.

Besides the goals discussed above, the “Actors/Goals affinity chart” also allowed us the identification of the most widely shared goals among the actors. These were:

- Use a vineyard monitoring system able to generate automatic treatment alerts;
- Improve the wine quality and productivity through InovWine;
- Access the vineyard/grapevine history;
- Detect fungi in vineyards in due time;
- Increase the competitiveness of the ACC wine;
- Sell products and services developed during the project or get royalties through spin-offs;
- Promote the ACC wines through InovWine;
- Enhance the precision of current treatment warnings (provided by the Bairrada station).

We grouped the identified goals into three clusters:

- The ones focused on boosting the ACC in the wine market (improve the wine quality and productivity, increase its competitiveness and promote it through InovWine), which are shared by the ACC and the producers. For the latter, it is very important to strengthen and promote the ACC, in order to render their products lucrative. These aims are also shared by the Portuguese State that intends to increase exports and promote a qualified domestic industry.

- The ones that explore the commercialization of products and services developed during the InovWine project. These goals are mainly shared by IPN and Biocant (or future spin-offs), but also by the ACC in the case of the new yeasts.
- The ones that address the vineyard treatment (detection of fungi, vineyard history, current warnings, the monitoring system that generates alarms, and enhancement of the wine quality and productivity). These goals receive a wider range of attention from all the actors. They involve data or services relevant to the ACC business model, but they can also be applicable in scenarios beyond the ACC, increasing its sphere of action. For instance, IPN and Biocant share the purpose of accessing the InovWine database - even after the end of the project. Vineyard and meteorological data from multiple years can be an important source of information for the future scientific activities of these organizations. There are also indications that the meteorological data gathered by the wireless sensor network can be of interest to the meteorological station ("Networked business model description chart", Table 28).

To maintain the networked business model cohesion it is crucial to assure that its actors can accomplish their individual goals. This restriction becomes even more important when the actors play crucial roles. If they do not feel committed, they may abandon it, causing its collapse. With the expectation of avoiding this scenario, in *Step II.a "Detection of dependencies among goals"* (previous section) we used the "Common goal diagram" (Figure 47) to identify critical goals to the accomplishment of the business model's overarching goal. Then, in this section, with *Step II.b "Identification of actor affinities"*, and its "Actors/Goals affinity chart", we acknowledged each actors expectations and disclosed possible collaborations that can strengthen the network connections. This outcome served as further evidence on the relevance of evaluating the goals identified in *Step II.a* as critical, this time based on their impact on the individual goals identified in the "Actors/Goals affinity chart", especially the ones most shared. Furthermore, *Step II.b* pointed out clues about the actors' expectations for the business model and offered hints on how many actors are really interested in keeping their participation.

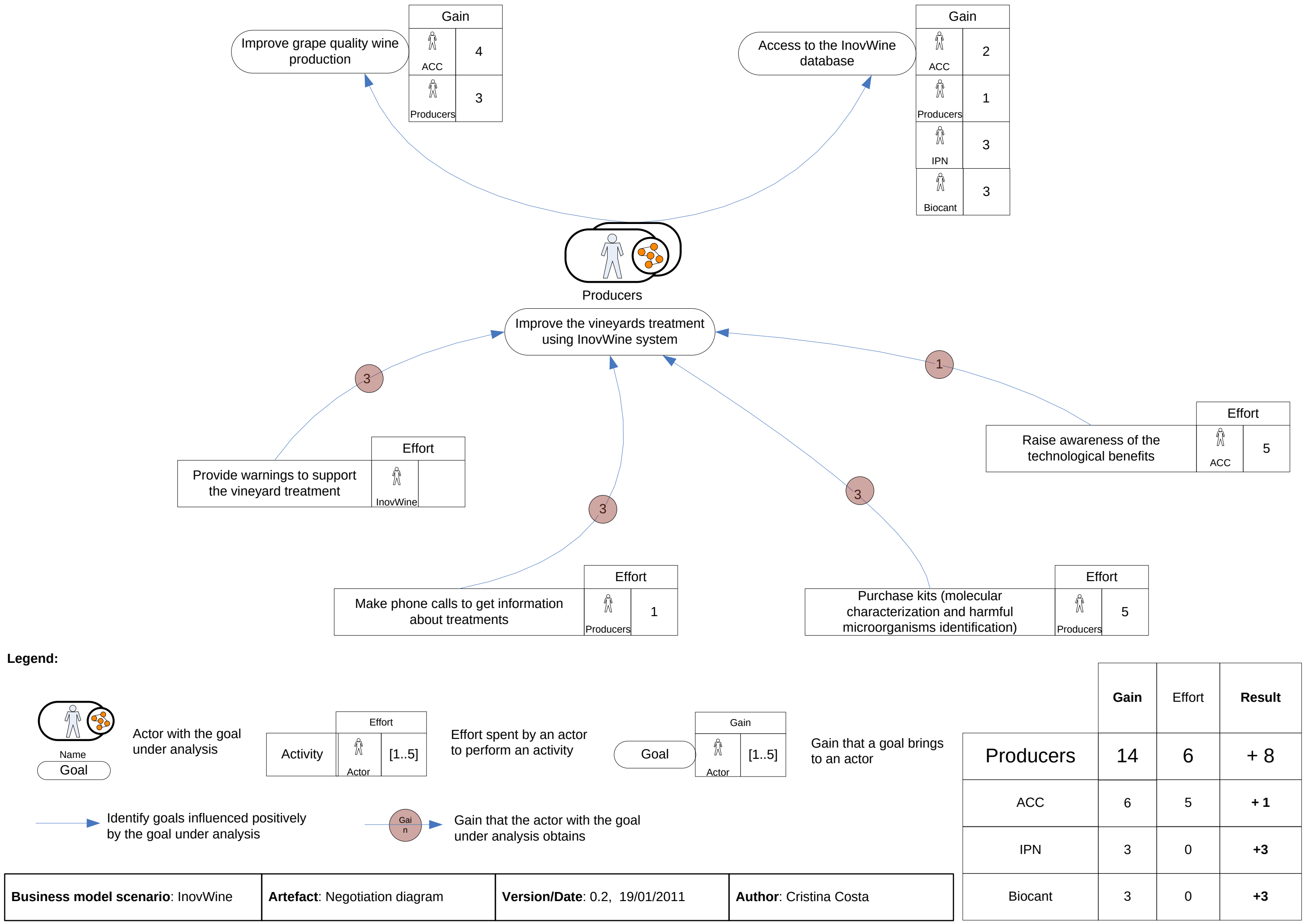
The insights we obtained in *Step II.a* and *Step II.b* provided us with the basis to advance to *Step II.c "Negotiation of actor contributions"*. This step consists in an estimation of the critical goals viability to perceive the need to make adjustments on the envisioned networked business model.

7.2.6 Phase II, Step II.c – Negotiation of actor contributions

In *Step II.c*, we used "Negotiation diagrams" to appraise the two critical goals identified in *Step II.a* (section 7.2.4): "Improve vineyards treatment using InovWine system" and "Enhance the quality of the produced wine". The data gathered in the previous steps of BIZ2BIS aided us to understand the context of these goals in a comprehensive and detailed way by covering aspects as distinct as performed activities, exchanged flows, expectations of the actors, existing interactions, possible collaborations, and established rules. Therefore, we used this knowledge to detail in two "Negotiation diagrams", one per critical goal, what can affect them and how they can influence others goals and the expectations of the involved actors. We aimed at estimating if the suggestions we proposed to the InovWine business model (in section 7.2.3) presented a satisfactory alignment of interests. Our estimation of that alignment was directly connected with the values of gain and effort that we assigned to the diagrams' fields (based on the information we collected in BIZ2BIS previous steps). Since the values in the initial version of the diagrams represented our perception of the scenario under study, occasionally, we posed additional questions to the actors in order to clarify doubts (e.g., in follow-up meetings). Based on their opinions, we considered several adjustments to the proposed business model in order to encourage the maintenance of the actors in the network. We only stopped our iterative search for alternative scenarios (we used the output obtained in each trial to plan the next attempt), when the actors themselves assessed and accepted the proposals embedded in the diagrams as satisfactory. Their collaboration provided us additional indications that we were able to integrate and align their interests in the goals under analysis.

We present in Figure 48 the "Negotiation diagram" of the goal "Improve vineyards treatment using InovWine system". It is based on the assumption that the producers would no longer acquire their own wireless sensor network. Alternatively, they will have access to a shared and expanded wireless sensor network installed across the lands of the cooperative members. This network does not allow the acquisition of abiotic data for each vineyard and consequently does not consider the particularities of each field (with exception of the vineyard in which the pilot study took place or others whose owners may decide to acquire their own network). However, it provides the means to obtain representative abiotic data on the region. Obviously, this configuration reduces the precision of the alarm system (based on more sparse information). Nonetheless, since many of the vineyards possess small dimensions, and many of them share the same characteristics, the information obtained by the shared network maintains its pertinence and usefulness. Furthermore, it holds an indisputable advantage: it removes the financial pressure placed previously on the producers, drastically decreasing their participation effort.

When balancing the goal "Improve vineyards treatment using InovWine system", we also took into account the need to induce producers to use new technologies. For this reason, training actions provided by the ACC were kept in this version of the business model. These actions demand a huge exertion from the cooperative. Nevertheless, the enhancement of producers' technological skills can be a powerful tool to improve vineyard treatments and the wine quality. The latter has particular interest for the cooperative. To promote the producers' interaction with the InovWine system, we also suggested that the regular alarms could be complemented with a phone call (avoiding the use of e-mails and SMS - Short Message Service). This add-on can be easily used by the producers, involves very low costs, and clearly favors their first contact with the InovWine system. Furthermore, it can entice their participation and maintenance in the business model, as well as impel them to insert personal and vineyard data fundamental to enhance the accuracy of the generated alarms.



	Gain	Effort	**Result**
Producers	14	6	+ 8
ACC	6	5	**+ 1**
IPN	3	0	**+3**
Biocant	3	0	**+3**

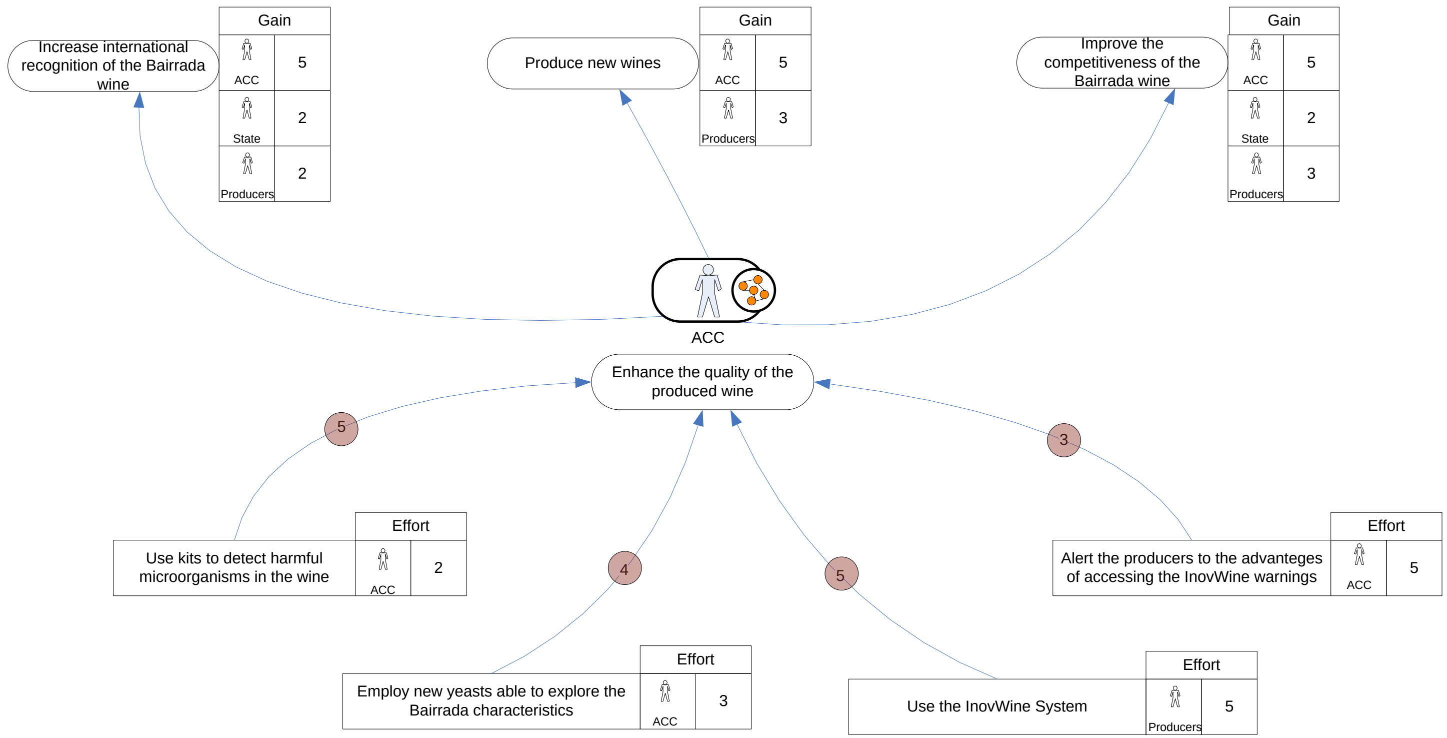
Business model scenario: InovWine	**Artefact**: Negotiation diagram	**Version/Date**: 0.2, 19/01/2011	**Author**: Cristina Costa

Figure 48: "Improve vineyards treatment using InovWine system" negotiation diagram

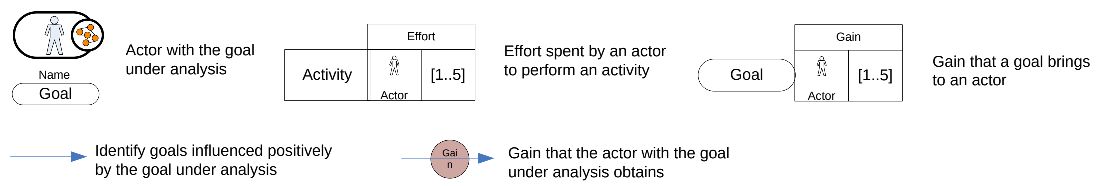
On the bottom part of the "Negotiation diagram" of the "Improve vineyards treatment using InovWine system" goal (Figure 48), we can observe how its supporting activities contribute to the gains of producers (values placed in the red circles). Notwithstanding the new wireless sensor network loss of precision, on the upper part of the diagram we can see that the accomplishment of the goal continues to have positive implications on other goals (e.g., "Improve grape quality and wine production", as well as "Access to InovWine database"). When comparing the two configurations we evaluated for the wireless sensor network, we can see that the results obtained with the shared network (Figure 48) are not as meaningful as those obtained with a wireless sensor network per producer (Figure 46). However, the involved effort is substantially reduced (to the point of making it feasible) and the additional features introduced through the phone call diminish the interaction limitations of the producers. The alignment apparently achieved with the shared network provides positive indications on the willingness of the producers to contribute to its success.

It is also crucial for the InovWine networked business model that we probe the goal "Enhance the quality and productivity of the wine". We present its "Negotiation diagram" in Figure 49. This goal is strictly related to the ACC and, similar to the one previously analyzed, also depends on the aptitude and motivation of the producers to use the InovWine system. Therefore, it will be fundamental to its accomplishment that the cooperative will be able to exert its influence and lead producers to carry out the tasks assigned to them. Beyond the adoption of the InovWine system, this goal also depends on two other activities (see bottom part of the diagram): the use of new yeasts and kits to detect microorganisms in the wine. The former stimulates the natural qualities of the grapes and mitigates many of the problems associated with the use of the Baga variety in the production of young wines. The latter reduces the time to detect harmful microorganisms (pathogens) in the wine and enhances the cooperative's chances to deal with them and avoid situations that may place its production at risk. The goal addressed in this "Negotiation diagram" provides meaningful gains to the cooperative and positively influences other business goals. As can be observed in the upper part of the diagram, it aids to "Produce new wines" and "Improve the competitiveness of the Bairrada Wine". By enhancing the quality of the produced wines, the ACC will reinforce its national and international recognition, strengthening its position in the market, which is also significant to the Portuguese State.

When analyzing the results presented in the bottom right hand corner of the "Negotiation diagram" of the goal "Enhance the quality and productivity of the wine" (Figure 49), we can see that the gains it provides are significant. These marks support our belief that this goal gathers all the necessary conditions to be accomplished, and that can counterbalance the support that ACC has to provide to other goals in the business model (e.g., provide formative actions). When estimating the cooperative favorable balance, we took into account that the project funds supported the discovery of the new yeasts, the acquired equipment, as well as the costs of research and development of the kits and of the InovWine system, minimizing substantially its financial effort to access this cutting-edge technology. In fact, the mentioned benefits were in the origin of the cooperative interest in the InovWine project.



Legend:



	Gain	Effort	Result
ACC	32	10	+22
Producers	8	5	+3
State	4	0	+4

Business model scenario: InovWine	**Artefact**: Negotiation diagram	**Version/Date**: 0.1, 19/01/2011	**Author**: Cristina Costa

Figure 49: "Enhance the quality of the produced wine" negotiation diagram

The presented "Negotiation diagrams" show clear advantages for the ACC and its members in using the InovWine system with the adjustments that we proposed. Of course, these actors have to support the achievement of other goals not analyzed. However, these are less vital to the business model, or are not as expensive, or involve activities that would have to be performed, regardless of the existence, or not, of the InovWine system.

7.2.7 Phase I, Step I.c – Representation of the redesigned business model

BIZ2BIS pointed out a set of adjustments to the business model submitted to NSRF in order to strengthen the presence of the actors in the network and ensure that the solution we envisioned was able to respond to their expectations. Since this new vision presents significant differences when compared with that described in the initial NSRF proposal, we considered it wise and pertinent to promote discussion. To foster communication between all actors, we decided to return to BIZ2BIS' *Phase I*, *Step I.c "Representation of the business model"* and use the information gathered in *Phase I*, *Step I.a* and *Step I.b* to create a "Flow diagram" that depicted the latest version.

We present the developed diagram in Figure 50. It describes how the interactions among the actors embed the outcomes of the InovWine project. Four relevant examples of developed products and services are: a monitoring and alarm system supported by a wireless sensor network, RFIDs systems, molecular characterization kits, and microorganism identification test kits. The first two require maintenance services, while the last two are supported by laboratory tests. In the "Flow diagram" of Figure 50, we did not consider how these outcomes would be placed at the disposal of the actors and commercialized. For readability sake, we decided to detail financial flows in a new "Flow diagram" (Figure 51). An additional reason to separate them from the more stable configuration of network flows in Figure 50 was also the uncertainty on how these flows will be managed. The inherent component of indecision and unpredictability in a project like InovWine makes it difficult to clarify its commercial transaction outline in an early stage. As questions relevant to its exploration begin to be answered (e.g., costs of the solution, maintenance periods, access to the database, and the producers' level of acceptance towards the products and services) financial details will be adjusted, as well as the corresponding "Flow diagram" in Figure 51. Actors with the power to settle on the future directions will have to consider how maintenance services and laboratory support will be managed at the end of the project, when no more public funds will be available. In an attempt to identify critical dependencies in these activities, we decided to move on to BIZ2BIS' *Phase II*, *Step I.d "Description of critical dependencies"*.

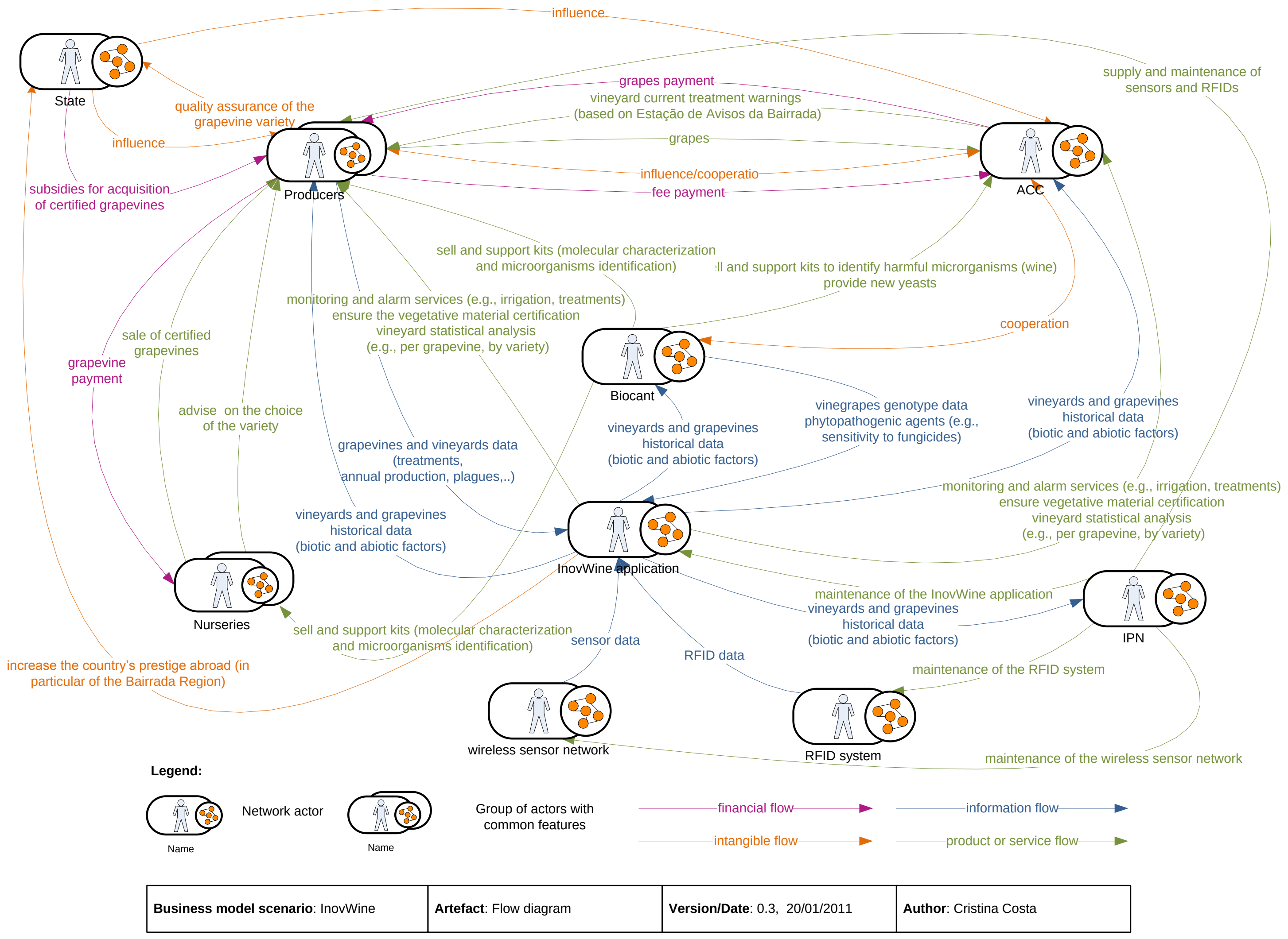
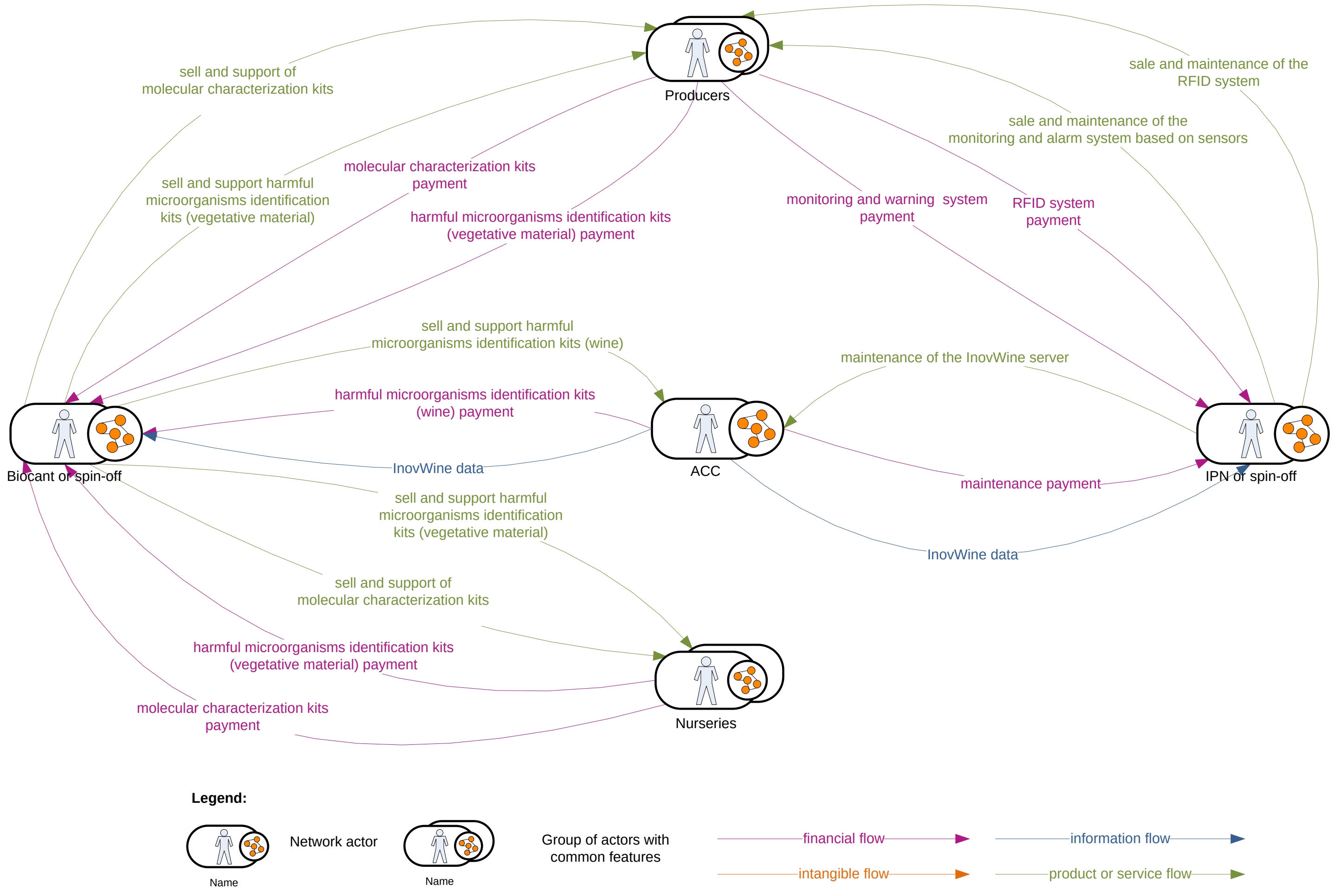


Figure 50: Flow diagram of the envisioned InovWine business model



Business model scenario: InovWine	**Artefact**: Flow diagram	**Version/Date**: 0.2, 21/01/2011	**Author**: Cristina Costa

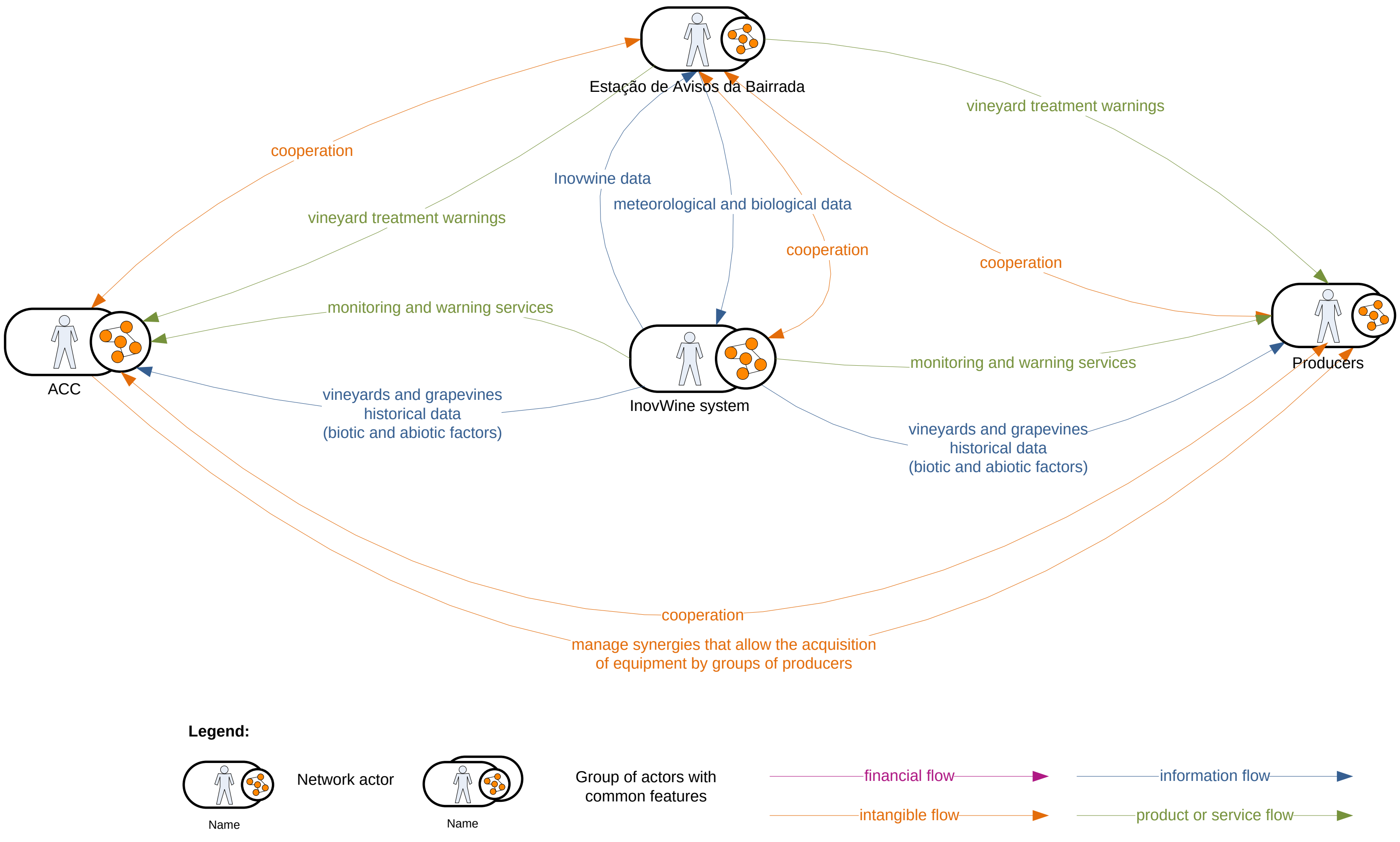
Figure 51: Flow diagram of the InovWine commercial interactions

7.2.8 Phase II, step II.d –Discussion of threats to the redesigned business model

To support and promote discussion on how the services provided by IPN and Biocant could be integrated into the business model, we developed the "Dependency diagram" presented in Figure 52. By detailing its business model flows, it became clear that, to detail the actor interactions with these services, the two technological centers would have to clarify if they would treat ACC and its members as regular clients. This choice must be well pondered. In spite of the profits that supporting activities (like the maintenance of the equipment) can bring, high prices can lead actors to abandon the network (red "X" in the diagram), thus undermining and putting at risk already developed work, and consequently the chances of getting royalties or profit from the sale of products or services. To minimize this scenario, we proposed the establishment of partnerships, for example: maintenance fees could be reduced, in exchange for a privileged access to the InovWine database; or collective purchases could be organized in order to reduce cost acquisitions, thus promoting InovWine adherence (orange rectangle). These purchases must be done in agreement with ACC, since the cooperative will hold and manage the InovWine information system (including the registration of its users and of acquired equipment).

In the proposals presented so far, we only addressed acquisitions of services carried out by actors involved in the InovWine business model. However, these services can be of interest to external actors. In this case, the transaction will be guided by the contract already established among the actors responsible for the InovWine project, whose clauses specify how the project achievements must be explored. These external relationships give rise to new business models, which go beyond the scope of the InovWine business model. Therefore, we do not consider them in our study.

The identification of the goals that each actor expected to achieve with the network (section 7.2.1) complemented with the detection of possible collaborations (section 7.2.5), led us to explore affinities beyond the ones we already covered (between ACC, producers, Biocant, and IPN). For instance, the activities currently developed by the Meteorological Station of Bairrada, as well as its perceived interests and problems, made us believe that synergies can be exploited around this actor. Taking into account its present role, we looked at how its participation could be more active in the InovWine business model (see Table 28, field "Network opportunities" and Table 36). To present and discuss this hypothetical scenario, we returned again to *Phase I*, *Step I.c "Representation of the business model"*. We used the "Flow diagram" to present our proposals as we detail in the next section.



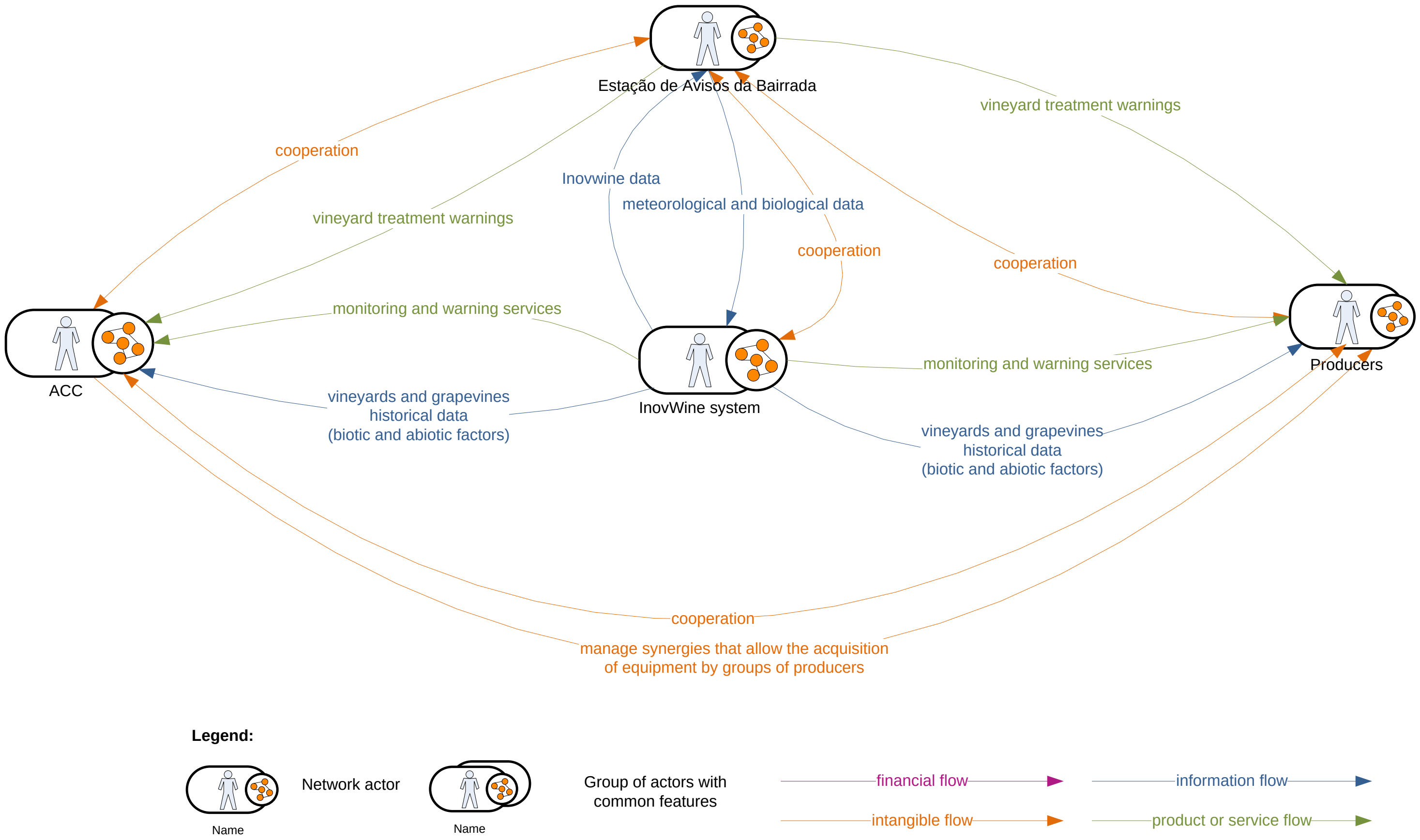
Business model scenario: InovWine	**Artefact**: Flow diagram	**Version/Date**: 0.1, 22/01/2011	**Author**: Cristina Costa

Figure 52: Dependency diagram of the InovWine maintenance protocol/contract

7.2.9 Phase I, step II.c –Representation of complementing scenarios

At present, the Meteorological Station of Bairrada receives meteorological data from a network of stations installed between Estarreja (northern boundary) and Soure (Southern limit) that measures the maximum and minimum temperature of the air, relative humidity and precipitation. Given the distances that separate the stations, the meteorological station hired collaborators that, on a daily basis, report by land mail complementary meteorological data from small stations installed on their fields. In addition to the meteorological component, its warnings are also corroborated by biological data and phenological observations. The ACC subscribes this service provided by the meteorological station. On the contrary, the majority of its producers prefer not to pay for it. As a consequence, in many cases they do not have access to the warnings in due time. As seen during the interviews, the cooperative has some difficulties in transmitting warnings to the producers, since most of these have problems is using e-mail systems or reading mobile text messages. The information dissemination is usually made in person (usually by ACC technicians), which inhibits an expeditious transmission and jeopardizes the pertinence of warnings. The meteorological station also has to deal with this communication difficulty. Although it can issue alerts by email and SMS, usually it has to post them, which can be critical to the responsiveness of the producers in urgent cases, and thus affect the prestige of the meteorological station (*Phase I*, *Step I.a*, "Networked business model description chart", Table 28).

The difficulties of the meteorological station in issuing the warnings in a timely manner can be minimized by the InovWine information system (through its phone calls). Furthermore, its shared wireless network can complement the station database with specific climate data on the region. In turn, the meteorological station expertise and data can be used to "tune" the InovWine algorithms used for generating the alarms. We depicted this complementing scenario in Figure 53 and the project managers took it under consideration. We want to notice that this cooperation can be performed with another meteorological station. We took the initiative to indicate Bairrada due to its proximity and the already established relationships with ACC. To provide a broader understanding of our suggestions and make their appraisal easier, we provided a condensed and comprehensive overview of the proposals we discussed in the three developed "Flow diagrams" (the updated version of the business model, its commercial transactions, and the hypothetical cooperation with the station) in the form of a matrix (see Matrix 3). The obtained knowledge on the wine industry, also led us to consider another completing scenario able to explore the insights gained during the project to better meet the needs of large producers. The actor with the power to make decisions found the scenarios we proposed appealing. To better realize their potential, we established contacts and initiated negotiations that lasted several months, as detailed in the agenda in Appendix A. The scenario that considered the participation of the meteorological station in the business model became unviable due to financial difficulties. A large producer considered the InovWine project promising and applied the insights acquired to improve its business with good results. However, since its study goes beyond the scope of the InovWine business model, the outcomes obtained will not be presented in this dissertation.



Business model scenario: InovWine	**Artefact**: Flow diagram	**Version/Date**: 0.1, 22/01/2010	**Author**: Cristina Costa

Figure 53: Flow diagram of synergies with a meteorological station

ACTOR - TARGET

ACTOR - SOURCE

Value propositions	Meteorological Station	ACC	Producers	InovWine system	State/QREN	Biocant	IPN	Nurseries
Meteorological Station		- vineyard treatment warnings - cooperation	- vineyard treatment warnings - cooperation	- cooperation				
ACC	- cooperation		- manage synergies that allow the acquisition of equipment by groups of producers - Influence/cooperation - grapes payment			- cooperation - harmful microorganisms identification kits (wine) payment - InovWine data	- system maintenance payment - InovWine data	
Producers	- cooperaton	- grapes - fee payment - influence/cooperation		- grapevines and vineyard data (e.g, treatments, annual production, plagues)	- quality assurance of the grapevine variety	- kits payment (molecular characterization and harmful microorganisms identification)	- monitoring and warning system payment	- grapevine payment
InovWine system	- InovWine data - cooperation	- vineyards and grapevines historical data (biotic and abiotic factors) - monitoring and alarm services -ensure the vegetative	- monitoring and alarm services - ensure the vegetative material certification - vineyard statistical analysis		- increase the country's prestige abroad (in particular of the Bairrada Region)	- vineyards and grapevines historical data (biotic and abiotic factors)	- vineyards and grapevines historical data (biotic and abiotic factors)	
State/QREN		- Influence	- Influence - subsidies for acquisition of certified grapevines					
Biocant		- Cooperation - sell and support kits to identify harmful microrganisms (wine) - provide new yeasts	- sell and support kits (molecular characterization and microorganisms identification)	- vinegrapes genotype data phytopathogenic agents (e.g., sensitivity to fungicides)				- sell and support kits (molecular characterization and microorganisms identification)
IPN			- supply and maintenance of sensors and RFIDs	- maintenance of the InovWine system				
Nurseries			- sale of certified grapevines - advise on the choice of the variety			- kits payment (molecular characterization and harmful microorganisms identification)		

Business model: InovWine | **Version and Date:** 0.1, 23/01/2011 | **Author:** Cristina Costa

Matrix 3: Flow matrix of the updated version of the InovWine business model (includes complementing scenarios)

Next, we will advance to Phase II, Step I.e "Stabilization of the envisioned value propositions" to identify the value propositions made available by the InovWine business model, excluding for the above reasons the two complementing scenarios discussed in this section.

7.2.10 Phase II, Step II.e – Stabilization of the envisioned value propositions

Supported on BIZ2BIS' insights, we gathered the proper conditions to stabilize the envisioned value propositions for the InovWine business model, according to the guidelines established in *Step II.e*. On the one hand, *Step I.c "Representation of the business model"* and its "Flow diagrams" (Figure 50 and Figure 51) provided us with a detailed list of the existing business flows. On the other hand, *Step I.b "Description of participating actors"* and the developed "Actor description charts" (from Table 29 to Table 37) detailed the activities carried out by the actors. By knowing who performs the activities, what they comprise, and the resulting flows, we could prospect their assembling possibilities. The arranged combinations allowed us to make out the resulting value propositions and gear them towards the aims of the participating actors. First, we listed the identified flows based on the developed "Flow diagrams". Next, based on the information gathered on the network and its actors (in *Step I.a* and *Step I.b*), we created our draft version of the value propositions. We placed the identified flows in the first column of the "Business Flows/Value propositions chart" (artifact developed for *Step II.e*) and inserted the value propositions in its first row. Then, for each flow, we iteratively tried to recognize the value propositions it could support. If these had not yet been identified, we added them. A similar approach was applied to groups of flows. It was important to perceive how flows could be brought together, and identify the value proposition(s) they could give rise to. For instance, the flows from F1 to F5, and F13 allowed us to identify V4 "Improve the support to the ACC producers". As an outcome of the "Business Flows/Value propositions chart", we can visualize the resulting value propositions and their related flows.

We note that the obtained list of value propositions must be able to address the goals identified in *Step II.b "Description of participating actors"*, in the "Actors/Goals affinity chart" (Table 38, which provides a compacted vision of the actors' goals in the business model). Otherwise, the business model will have strong chances of failure, given that some of the actors will not see their interests satisfied. In the InovWine business model, when confronting value propositions and expected goals, we checked that the updated version of the business model was able to respond to the interests of the actors. To make the scope of some value propositions identified in the chart clearer and to facilitate its correspondence with the actors' goals, we performed minor adjustments in our initial list. For instance, we subdivided some of them into two and slightly changed their early designations.

Table 39: InovWine Business flows/Value propositions chart

Business flow/Vale proposition chat		Increase the quality of the ACC wine through the InovWine information system	Increase the ACC members' productivity through the InovWine information system	Safeguard the Bairrada genetic heritage	Improve the support to the ACC producers	Detect harmful microorganisms in the vineyards	Obtain scientific prestige through the dissemination of new technological products for the wine industry	Get royalties through project spin-offs, or profit from the sale of products or services	Use InovWine monitor and alarm services	Improve warnings specificity and accuracy	Access to the grapevines history	Get prestige in the wine industry	Access to the vineyard history	Detect harmful microorganisms in wine	Create new wines based on the discovery of new yeasts	Receive the ACC members' fees	**Number of value propositions**
		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	
Monitoring and alarm system service	F1	X	X	X	X	X	X	X	X	X	X	X	X				12
Grapevines and vineyard data entered by the producers (e.g., treatments, and	F2	X	X	X	X	X	X	X	X	X	X		X				11
Grapevines genotyping kit service (includes the sell, support, and data)	F3	X	X	X	X	X	X	X	X		X						9
InovWine vineyards historical data (biotic and abiotic factors)	F4	X	X	X	X	X	X			X			X				8
Kit to detect harmful microorganisms in the grapevines (sell, support, and data)	F5	X	X		X	X	X	X	X		X						8
InovWine grapevines historical data (biotic and abiotic factors)	F6	X	X	X	X	X	X			X	X						8
ACC influence in the region	F7			X	X	X			X			X		X	X	X	8
Kit to detect harmful microorganisms in the wine(sell, support, and data)	F8	X	X				X	X						X	X		6
Sell of certified grapevines	F9	X	X	X													3
Subsidies for acquiring certified grapes	F10	X	X	X													3
Maintenance of the InovWine system (application, wireless sensor network,	F11							X	X								
Delivery of grapes to the ACC	F12	X	X														2
Vineyard current treatment warnings (provided by ACC to its members)	F13				X											X	2
Advise on the choice of the grapevine variety	F14	X	X														2
Cooperation to commercialize identified yeasts	F15							X				X					2
Prestige and promotion of Portugal (especially of the Bairrada Region)	F16											X					1
Synergies around improving the quality of the warnings	F17									X							1
Number of business flows		11	11	8	8	7	7	7	6	5	5	4	3	2	2	2	
Business model: InovWine		**Version and Date:** 0.5, 05/02/2011								**Author:** Cristina Costa							

The analysis of the "Business Flows/Value propositions chart" (Table 39) allowed us to disclose the flows that support more value propositions. These were:

- Monitoring and alarm system service;
- Grapevines and vineyard data entered by the producers (e.g., treatments and plagues);
- Grapevines genotyping kit service (includes the sell, support, and data);
- InovWine vineyards historical data (biotic and abiotic factors);
- Kit to detect harmful microorganisms in the grapevines (includes the sell, support, and data);
- InovWine grapevines historical data (biotic and abiotic factors);
- ACC influence in the region.

We paid special attention to the above flows, since the identified value propositions depend mainly on them for their achievement. For example, the first two are closely related to value propositions supported by a larger number of flows and that gather a significant interest from actors. If these flows are placed at risk, the value propositions will be put into question, as well as the effort spent by the actors to perform the activities that support them.

Through Table 39 we could also identify the value propositions that depended on a higher number of flows. These were:

- Increase the quality of the ACC wine through the InovWine information system;
- Increase the ACC members' productivity through the InovWine information system;
- Safeguard the Bairrada genetic heritage;
- Improve the support to the ACC producers;
- Detect harmful microorganisms in the vineyards;
- Obtain scientific prestige through the dissemination of new technological products for the wine industry;
- Get royalties through project spin-offs, or profit from the sale of products or services.

The list above can be used as an indicator of the importance of the value propositions in the networked business model. It points out the ones supported by many flows, which may imply the involvement of more actors and a bigger effort from the network (exceptions to this logic are always possible). Furthermore, the list was useful to validate options performed during the application of BIZ2BIS. For instance, it ratified our decision of scrutinizing (in *Phase II*) two goals we considered critical to the business model: one that addressed the improvement of the vineyards treatment through InovWine and other that focused on the wine quality enhancement. The achieved list also reflects the outcomes of the negotiations carried out by encompassing the proposals that we, in collaboration with the remaining actors, articulated to promote the accomplishment of the networked business model's aims and meet the expectations of the actors. For instance, it confirms that contextual issues influenced choices made (e.g., specific actions were envisaged to minimize and motivate the participation of the producers, as well as to preserve the genetic heritage of the Bairrada's grapevines). Furthermore, several value propositions underline the effort to include in the InovWine system features with positive impact on crucial aspects of the wine production activity, such as the enhancement of the grapevine quality and productivity. They also emphasize the attempt to provide financial income to the participating actors and point out issues to explore when applying the outcomes of the InovWine project beyond the Bairrada Region. For instance, some actors (namely, Biocant and IPN) can use the obtained knowledge to develop similar services and systems and get dividends from other business models. ACC has a similar aspiration, shared with Biocant, but concerning yeasts.

The insights we obtained with BIZ2BIS' *Phase II* made us believe that the updated version of the business model reached a sustainable alignment. However, this is our perception. To avoid our bias and assure that the InovWine business model was able to express the actors' voices, views, and concerns, as well as to respond to their interests, we advanced to BIZ2BIS' *Phase III*.

7.2.11 Phase III, Step III.a – Evaluation of the actors perceptions

Step III.a enables the actors own assessment of the reached InovWine business model through the "Interview chart" (Table 40). In this artifact, we asked the actors that will continue in the business model after the end of the InovWine project to classify the value propositions with which they will be involved (from the ones identified in the "Business Flows/Value propositions chart", Table 39). They expressed their judgment of the effort spent to support a certain value proposition, as well as the gain obtained from it.

Beyond the evaluation that each actor makes of the value propositions, the "Interview chart" also encloses an extra perspective. It discloses how value propositions influence each other according to the perspective of each actor. We also encouraged the respondent actors to criticize the list of value propositions we presented to them. Only ACC suggested we change the designation assigned to V15 from "Receive quotas from the cooperative members" to "Increase the number of cooperative members". This amendment underlined, once again, that, in some situations, financial parameters are not the only factor, or the most suitable, to perceive the interest of the actors in a business model.

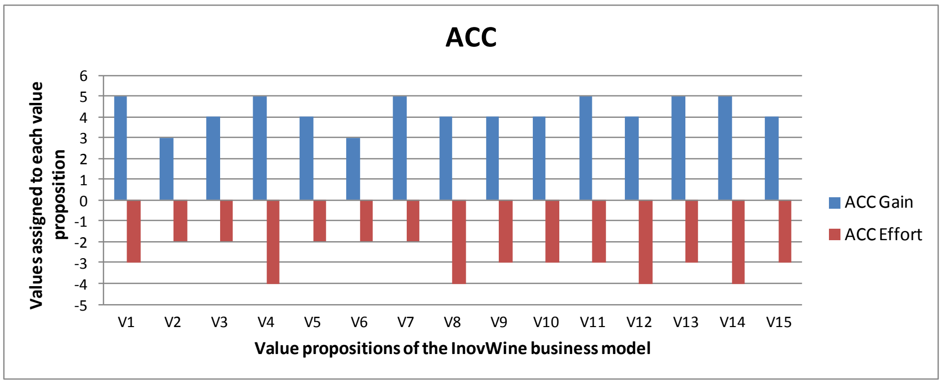
In Table 40 we can observe the values and the dependencies filled in by the actors. The provided data enabled us to perform three tests. First, we verified, for each actor, if the balance between the gain and the effort was positive. Then, we checked if the value propositions addressed by each actor were in accordance with their goals. Finally, we developed efforts to assure that problematic dependencies between value propositions had viable alternatives.

Table 40: Interview chart

Value propositions		Actors: ACC	Producer	IPN	Biocant
Increase the quality of the Bairrada wine	**V1**	(+5,-3)/ +V11,+V15	(+5,-5)/ +V11		
Increase the productivity of the Bairrada wine	**V2**	(+3,-2)	(+5,-5)		
Safeguard the Bairrada genetic heritage	**V3**	(+4,-2)/+V11	(+5,-5)/ +V1,+V2		
Improve the support to the ACC members	**V4**	(+5,-4)/+V15	(+5)/ +V1,+V2		
Detect harmful microorganisms in the vineyards	**V5**	(+4,-2)/ +V1,+V4,+V9	(+4,-3)/ +V1,+V2		(+4/-2)/ +V6,+V7
Obtain scientific prestige through the dissemination of new technological products for the wine industry	**V6**	(+3,-2)/+V11		(+5,-1)/ +V7	(+5,-1)
Get royalties through project spin-offs, or profit from the sale of products or services	**V7**	(+5,-2)		(+4/-2)	(+5,-1)
Use InovWine monitoring and alarm services	**V8**	(+4,-4)/+V1, +V2,+V4	(+5,-5)/ +V1,+V2	(+2/-1)	/+V6,+V7
Improve warnings specificity and accuracy	**V9**	(+4,-3)/+V4	(+5,-4)/ +V1,+V2		/+V6,+V7
Access to the grapevines history	**V10**	(+4,-3)/ +V4,+V8,+V9	(+3,-5)		
Get prestige in the wine industry	**V11**	(+5,-3)	(+5)	(+3/-1)	
Access to the vineyard history	**V12**	(+4,-4)/+V4, +V8,+V9	(+5,-3)/ +V1,+V2		
Detect harmful microorganisms in wine	**V13**	(+5,-3)/ +V1,+V11	(+4,-1)/ +V1		(+4/-2)/ +V6,+V7
Create new wines based on the discovery of new yeasts	**V14**	(+5,-4)/ +V1,+V11	(+5,-1)/ +V11		
Increase de number of cooperative members	**V15**	(+4,-3)/+V11	(-1)		
Date: 11/03/2011	**Sum**	(+64/-44)	(+56/-38)	(+14/-5)	(+18,-6)

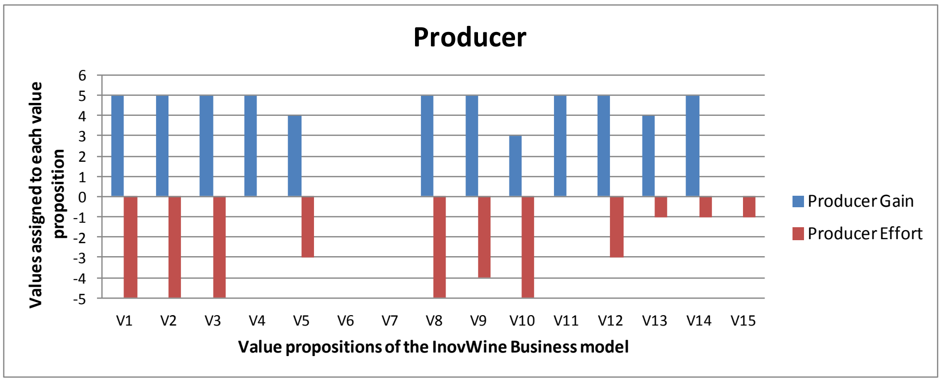
In the first test, we verified that all the actors considered their presence in the business model advantageous. In the field "Sum", of the "Interview Chart", everyone was able to obtain a positive difference between the obtained gain and the effort spent. The achieved results reinforced the indicators already provided by BIZ2BIS in *Phase II*, which pointed to a successful enrolment and commitment of the actors towards the networked business model. As we can see from the data, ACC and the producer expect to obtain significant gains through the available value propositions. In fact, most of them are related to these two actors, as well as to the accomplishment of critical aims for their activities. Nevertheless, we would like to note that the business model can also be very interesting for IPN and Biocant. Although having lower overall gains, these two actors more than doubled the value of the effort. Next, we will detail this information by analyzing each actor individually.

Graph 1 shows us that the gain obtained by ACC with each value proposition is always greater than or equal to 3 (value 3 was assigned to two of them, value 4 to seven, and value 5 to six). In addition, the gain achieved with each value proposition is always greater than the effort to support it, with the exception of V8 "Use InovWine monitoring and alarm services". This result confirmed the importance that we assigned to the goal "Improve vineyards treatment using InovWine system" and to its comprehensive study in *Step II.c* (see the developed "Negotiation diagrams" in Figure 46 and Figure 48). Through Graph 1, we can also see that ACC is linked to all the value propositions, confirming the outcomes of the "Common goal diagram" (Figure 47) and of the "Actors/Goals affinity chart" (Table 38) that already showed the relevant role of the ACC in the business model.



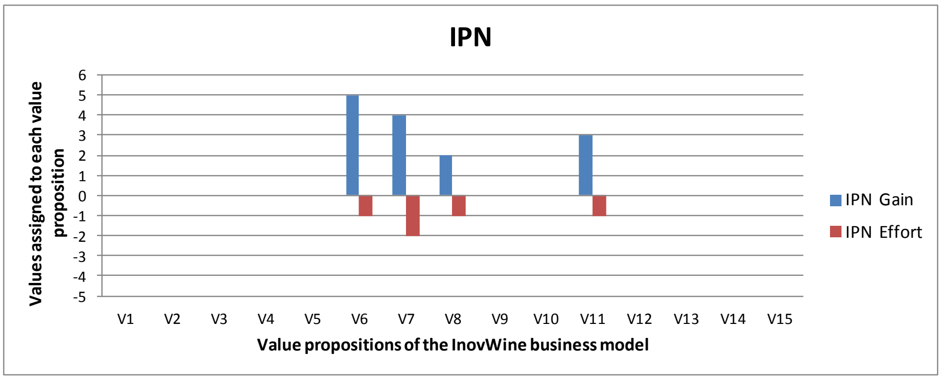
Graph 1: Gains and efforts of the ACC in the InovWine business model

Similarly, producers also have a strong presence in the conceived business model, as shown in Graph 2. The main difference lies in their absence from research and development activities, as well as from the commercialization of their outcomes. In spite of the benefits that the business model can bring to them, the effort they will have to carry out to insert the required data in the InovWine information system or to improve the accuracy of the warnings is undisputable. In the "Interview chart", when we questioned the pilot producer, he assigned the maximum value of effort to five value propositions. To diminish the producers' exertion, the technological illiteracy and the economical difficulties must be continuously fought, similarly to what we did in our proposals for the InovWine business model.

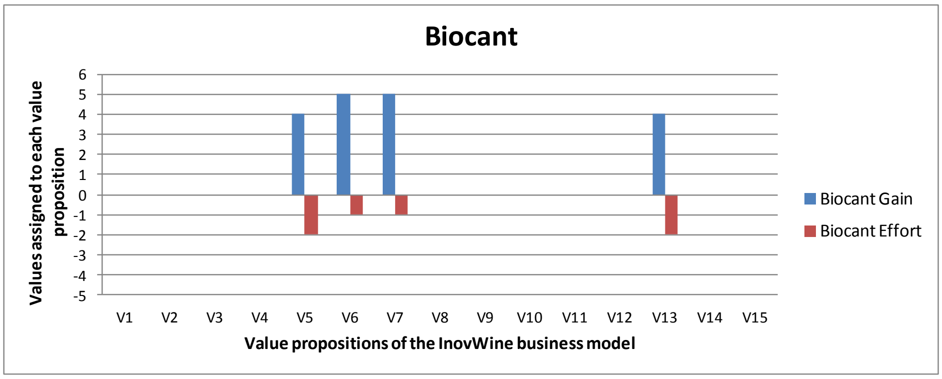


Graph 2: Gains and efforts of producers in the InovWine business model

Graph 3 and Graph 4 show that IPN and Biocant have similar interests in the InovWine business model (convergence already detected in the "Actors/Goals affinity chart", Table 38). The two organizations expect to benefit from the supporting services that must be provided to the InovWine systems (e.g., the application, the wireless network, and the kits). Besides that, the knowledge developed during the project will provide insights to their research activities and might as well contribute to enhance the prestige of these organizations or open up new business opportunities. Taking into account the benefits these organizations intend to achieve and that their activities of research and development have significantly been supported by the InovWine project funds (none of them filled in an effort that exceeds "-2"), their participation in the business model will undoubtedly be positive.



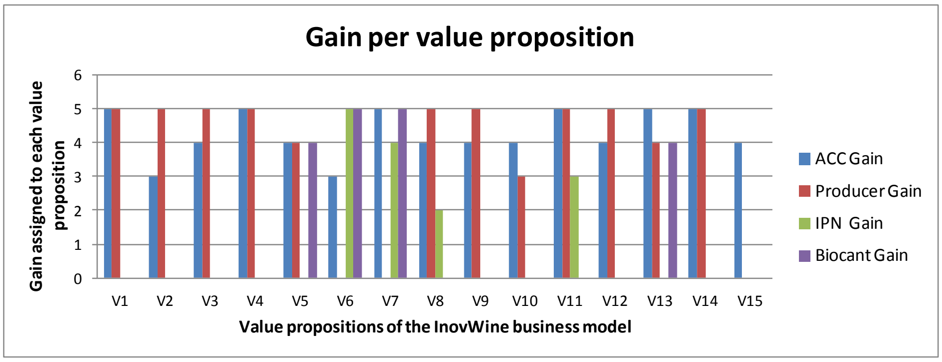
Graph 3: Gains and efforts of the IPN in the InovWine business model



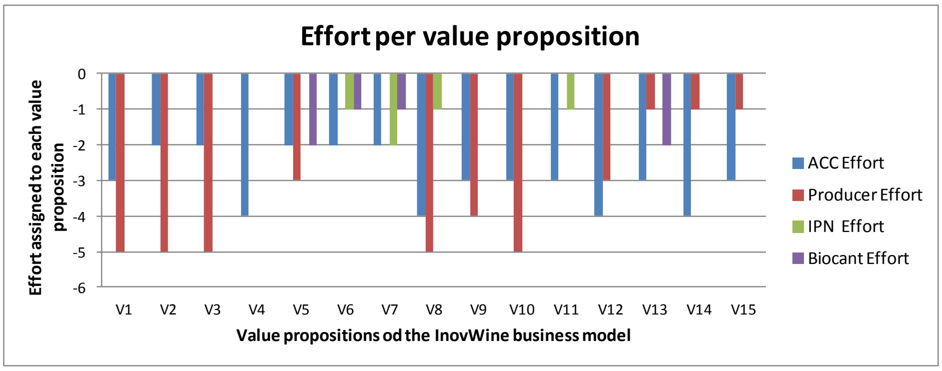
Graph 4: Gains and efforts of the Biocant in the InovWine business model

The data in the "Interview chart" also enabled us to check if the value propositions addressed by each actor were in accordance with their goals (detailed in the "Actor description charts", from Table 29 to Table 37) - the second test we carried out. By confronting both, the detected correspondences underlined once more the idea that the envisioned InovWine business model will be able to fulfill the aims of the actors. For instance, the majority of the value propositions listed in the "Business Flows/Value propositions chart" create favorable conditions to increase the quality and productivity of the Bairrada wine (one of the major aims expressed by ACC and the producers in the "Actor description charts," in Table 29 and Table 30). The value propositions V6 "Obtain scientific prestige through the dissemination of new technological products for the wine industry" and V7 "Get royalties through project spin-offs, or profit from the sale of products or services" also support IPN, Biocant, and ACC aspirations in getting royalties and enhancing their prestige ("Actor description charts," in Table 29, Table 31, and Table 32). The described verification was carried out for all the goals pointed out by the actors.

We will now look at the data in the "Interview chart" from the perspective of the value propositions. Graph 5 shows us the gain that the actors expect to achieve with each of them. From the analysis of the results, we can confirm that ACC and the producers stand out for two reasons: the number of value propositions from which they intend to get some kind of gain and the value of the acquired gains. While these actors expect to benefit from value propositions related to the wine production, IPN and Biocant are focused on the ones implicated in research and development activities (namely in the commercialization of the achieved outcomes). However, we want to note the involvement of the ACC (including the latter group), underlining its relevance and influence in the business model. In addition to the discussed gains, in Graph 6 we cover the efforts carried out to make the value propositions viable. When analyzing the graph, we see that the producers and ACC are their major providers, but with a higher incidence on the former (entering vineyard data in the system is not an easy task for these actors). The stringent behavior demanded from the producers was unavoidable. To counterbalance, and in an attempt to minimize their financial difficulties, the envisioned business model excluded the need to purchase technological devices.



Graph 5: Gain that the actors of the InovWine business model obtain per value proposition



Graph 6: Effort that the actors of the InovWine business model spend per value proposition

Based on the data in the "Interview chart", we created a list of the value propositions to which the actors assigned more gains. It essentially addresses the ones able to support the achievement of the goals that motivated their participation in the business model. Below, we present the top of the list (topics in the same item were assigned with an equal gain):

1. V7 "Get royalties through project spin-offs, or profit from the sale of products or services";
2. V6 "Obtain scientific prestige through the dissemination of new technological products for the wine industry", V11 "Get prestige in the wine industry", and V13 "Detect harmful microorganisms in wine";
3. V5 "Detect harmful microorganisms in the vineyards";
4. V8 "Use InovWine monitoring and alarm services".

The list of value propositions pointed out as more demanding to the actors are related to entering of data into the information system and the acquisition of devices to enhance the accuracy of the warnings (e.g., RFIDs, wireless sensor networks, or biological kits). At the top of the list we have:

1. V8 "Use InovWine monitoring and alarm services";
2. V1 "Increase the quality of the Bairrada wine" and V10 "Access to the grapevines history"

3. V2 “Increase the productivity of the Bairrada wine”, V3 “Safeguard the Bairrada genetic heritage”, V5 “Detect harmful microorganisms in the vineyards”, V9 “Improve warnings specificity and accuracy”, and V12 “Access to the vineyard history”.

When using BIZ2BIS in the InovWine project, we looked for all types of situations that could jeopardize value propositions, and developed efforts to find promising alternatives, avoid anti-programs, and reduce the negative impact that required exertions could have on the participating actors. The majority of our proposals to minimize dangerous dependencies were conceived in BIZ2BIS’ *Phase II*. We perceived that the involvement of the producers could be compromised and developed substitute scenarios that could encourage their participation. For instance, we changed the wireless sensor network configuration, suggested alternatives for the use of RFIDs, and promoted training activities. We aimed at providing additional guarantees that the producers would enter the vineyard data into the system, while motivating them to adopt the conceived business model and its information system. The “Interview chart” in Table 40 also shows the dependencies among value propositions identified by the actors, exposing their personal interests and their different perceptions towards the business model. The ones indicated by Biocant and IPN expose their commercial and research interests. While the ones mentioned by ACC and the producers address the wine sector, but each in a different stance. The relationships identified by ACC were focused on obtaining prestige in the wine industry, increasing the number of members, and enhancing the Bairrada wine (quality and productivity). In turn, the producers concentrated their attention on the latter. To end the analysis of the data obtained in *Phase III*, we will explore the dependencies among the value propositions through “Value proposition traceability diagrams” - the third test.

When considering all the dependencies identified by the four actors, we noticed that the value propositions that depended more on others were V1 “Increase the quality of the Bairrada wine”, V2 “Increase the productivity of the Bairrada wine”, and V11 “Get prestige in the wine industry”. While the ones with more influence on others were: V5 “Detect harmful microorganisms in the vineyards”, V8 “Use InovWine monitoring and alarm services”, V9 “Improve warnings specificity and accuracy”, and V12 “Access to the vineyard history”. The value propositions of the first group depend on the ones of the second group. These dependencies disclosed by the actors reinforce some of the decisions we took when applying BIZ2BIS. The insights obtained through its steps and artifacts alerted us to the importance of strengthening the viability of goals related to value propositions that can now be found in the first group. This awareness led us to scrutinize the ones in the second group in order to strength the ones in the first and make the business model more resistant against possible threats.

Below, we illustrate two of the four used “Value proposition traceability diagrams”: one that depicts the dependencies identified by ACC (Figure 54) and another that covers the ones pointed out by the producers (Figure 55). We selected these two over the ones that address the perception of Biocant and IPN, since the former provide a more comprehensive vision of the business model.

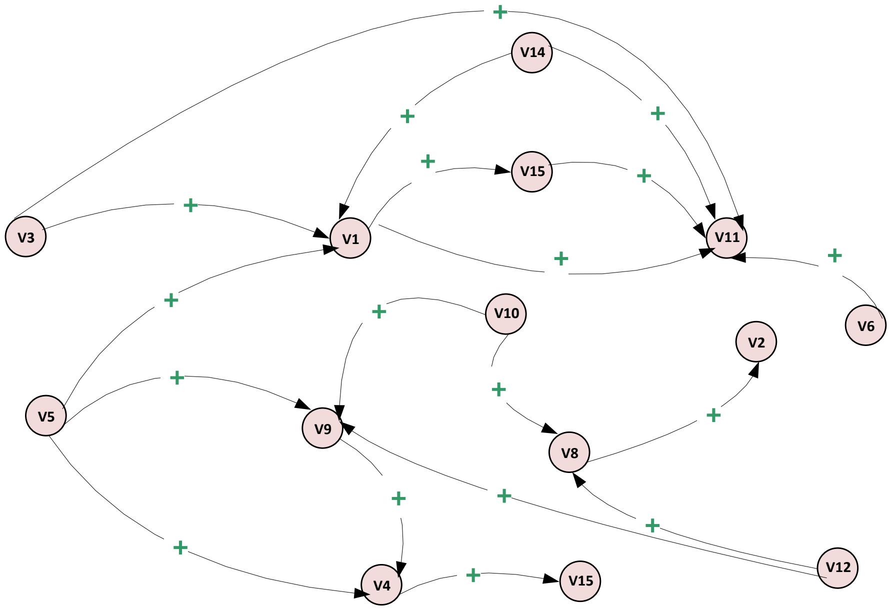


Figure 54: Dependencies among value propositions identified by ACC

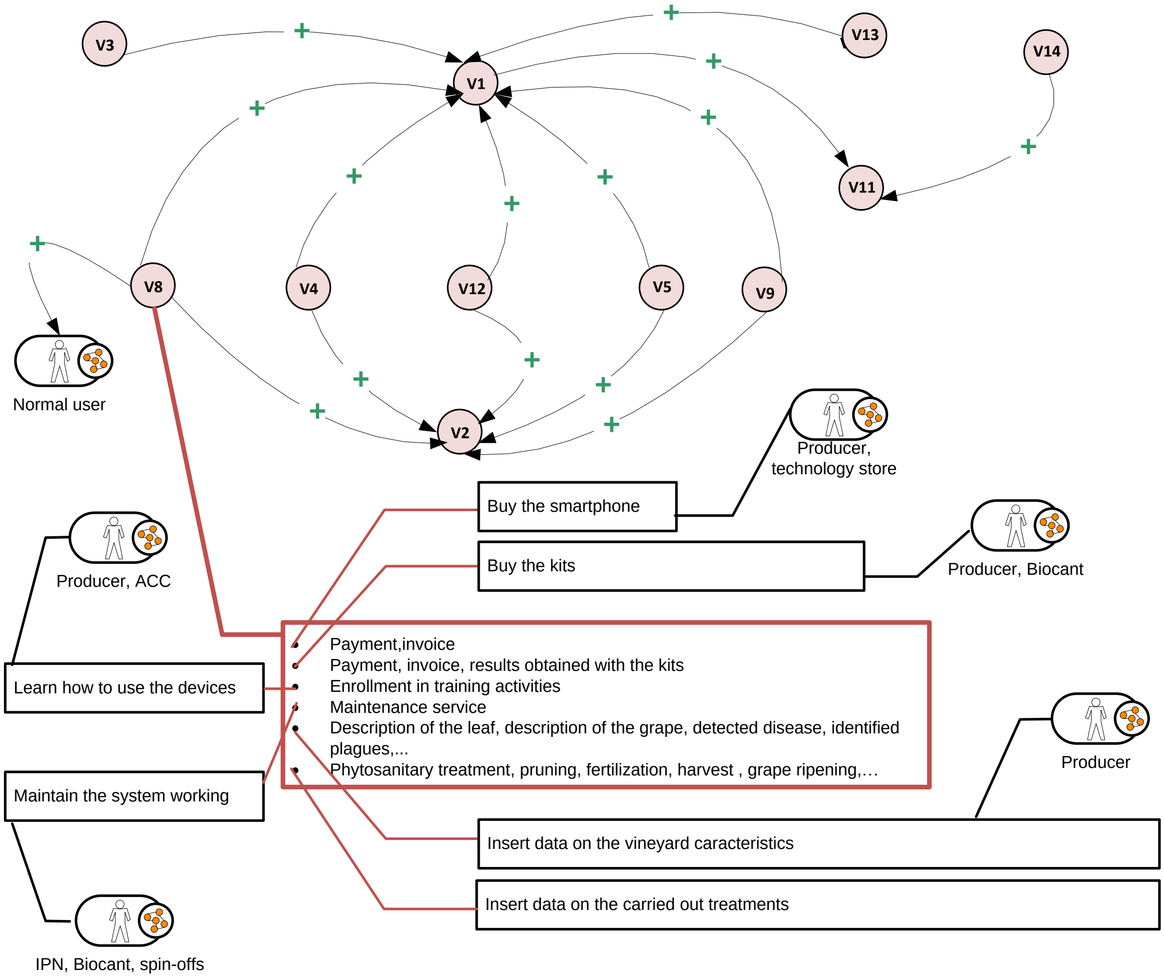


Figure 55: Dependencies among value propositions identified by the producer

Figure 54 shows a complex network of dependencies that only an actor with a broader perspective of the business model, like ACC, could detect. Nevertheless, the outcome is clearly shaped by its commercial concerns. In turn, Figure 55 underlines the importance that the producer assigns to the vineyard activities. It shows that increasing the quality and the productivity of the grapevines (V1 and V2) depends on the use of InovWine system and consequently on the data to be inserted by the producers (e.g., V8, V9, and V12). Since V8 “Use InovWine monitoring and alarm services” is a decisive value proposition for the business model, we decided to detail it in the “Value proposition traceability diagram” in Figure 55. We connected and related the information collected in several BIZ2BIS’ artifacts to provide a broad vision of the factors that can constrain or potentiate it, and its dependencies. We can see the flows associated with the value proposition in the rectangle with burgundy border (e.g., payments and vineyard’s data) and the activities they rely on, in the rectangles with black borders (e.g., acquisition of equipment and the introduction of data on the vineyards). The actors involved are also depicted. We can verify that all the points raised were targeted in our analysis. To expand and conduct this study for all value propositions would add unnecessary complexity to the diagram. Therefore, we only considered the most critical ones.

Through the interviews with the actors, in particular ACC, we were able to identify financial checks that will also contribute to decide if the conceived InovWine business model will be a success. These are:

- The treatments that the actors have to apply in the vineyard are costly: from 700 to 1200 euros per hectare. If the InovWine system can help to reduce at least one per year, it would become very appealing to the producers.
- The main source of income of the producers depends on the value that ACC assigns to their grapes. If the InovWine system aids to increase their quality and productivity, then the producers would be motivated to participate and enter the data about the vineyards in the information system.
- The yeasts used in Portugal were the result of a study conducted in France and do not take into account the intrinsic characteristics of the national grapes. To discover one that could potentiate its specificities would enhance the wine quality and the prestige of the cooperative. Furthermore, those yeasts would a have a huge marketing potential.
- The commercialization of the InovWine project’s outcomes can aid the ACC to support the activities of its members (e.g., obtaining funds to buy equipment). The importance of showing the InovWine system in use to prove its reliability may also encourage IPN and Biocant to charge affordable prices for the supporting and maintenance of the InovWine services.
- The prestige that ACC could gather by having the InovWine business model in use may lead to an increased number of members.

The mentioned points will only be achieved if the outcomes of InovWine project: the information system, the wireless sensor network, the RFIDs, and the kits will provide accurate results. Their research and development are outside the scope of this work. Supposing that these devices will work as expected, the goals that the actors look forward to achieve with the

InovWine business model will continue to be dependent on the data introduced by the producers. We note that the mentioned checks can only be analyzed after having the business model in use for some time. Knowing that the vineyard cycle takes a year, several may be need for us to draw conclusive results. The work developed in InovWine project suggests that the employment of approaches to discuss, design, and evaluate business models may be a long-term process, for which definite conclusions may be very difficult to draw. Longitudinal studies could add to reinforce the indications already given by BIZ2BIS.

7.2.12 Phase IV, Step IV.a – Specification of information system requirements

The information gathered about the InovWine networked business model allowed us to identify two main goals for its underlying information system:

- Built a solution that manages data automatically collected by the wireless sensor network, as well as information introduced by the producers about the vineyards (e.g., grapevines, treatments, interventions, plagues, and installed equipments). Search tools will be used to explore the available data and provide the producers with access to records and statistics on their assets.
- Develop an accurate diagnostic algorithm in order to aid producers improve the management of their vineyards, and consequently increase the productivity and quality of their grapes.

At this point of BIZ2BIS, it was necessary to translate the insights obtained from *Phase I*, *Phase II*, and *Phase III* into concrete high-level requirements to be met by the underlying information system. The concept of "service" helped us to perform this translation and provided a point of contact between the study of the business model and the internal business processes implemented by its supporting information system.

The identification of the services that the InovWine information system should provide were mainly based on the acknowledged value propositions (*Step II.e*, "Business flows/ Value propositions chart", Table 39). However, we complemented this information with the viewpoints of the actors on how the information system should support their needs. To provide these additional details on the service context, we resorted to items obtained in the course of our analysis. For example, we considered business flows that contributed to the identification and existence of a value proposition (*Step II.e*, the intersections in "Business flows/Value propositions chart", Table 39); the description of the activities performed by the actors that give rise to the flows and support the service features (*Step I.b*, "Actor description chart" artifact, from Table 29 to Table 37); and network topics that rule their operations (*Step I.a*, "Networked business model description chart", for instance fields "Mutual obligations and expectations", "Shared interpretations and representations", and "Existing rules", Table 28). In Table 41, we list all the identified services to be supported by the information system.

Table 41: InovWine information system services

Business scenario: InovWine – List of the identified services	
Id: 1	Authentication of user credentials
Id: 2	Registration of phytosanitary treatment
Id: 3	Registration of pruning
Id: 4	Registration of fertilization
Id: 5	Registration of harvest
Id: 6	Registration of grape ripening
Id: 7	Registration of disease
Id: 8	Registration of plague
Id: 9	Registration of the sensor node information
Id: 10	Registration of the RFID information
Id: 11	Registration of the data captured by the sensor
Id: 12	Registration of the data obtained with the RFID
Id: 13	Registration of detected phytopathogenic
Id: 14	Registration of the variety genotype
Id: 15	Registration of user
Id: 16	Registration of vineyard
Id: 17	Search for information about the producer
Id: 18	Search for information about the vineyard
Id: 19	Search for information about a set of grapevines
Id: 20	Search for devices in a vineyard
Id: 21	Generate warnings

In *Phase IV*, *Step I.a "Consolidation and description of requirements"*, we used the "Service specification chart" to describe in detail the services that the InovWine information system should provide. Below, we opted to present just some of those descriptions, since it would be too exhaustive to provide all them in this thesis. We chose the ones with high importance to the business model, unique characteristics, or the capacity to illustrate similar services. To show that the development team followed the guidelines provided by BIZ2BIS and make evident the successful transfer of knowledge, we present some of the user interfaces created for those services. We decided to show the ones related to the producers' activities and that reflect our user interaction concerns with these actors.

We would like to highlight that the development team did not participate in the conducted interviews. In spite of this, they were able to obtain the necessary information from our documents to implement the information system. We had a meeting with them, on the 20th of April 2011, to discuss our report on the business model and the elicited high-level requirements for its information system. The questions raised by them on the document addressed minor details (e.g., if some fields in the interfaces should be mandatory or not, if Biocant should have access to the system, or if an administrator should be appointed). No suggestion to change the artifact's fields or include extra information about the services was made. Furthermore, when we presented the application to Biocant and to ACC on the 30th of June, as well as to the producer of the pilot vineyard on the 4th of July, they did not suggest any changes; on the contrary, the actors were very pleased with the solution we presented.

From the identified services, we start by describing the "Authentication of user credentials" (Table 42), which enables the access to the InovWine information system. We gathered in Table 49 the interfaces developed to support the services. We placed the one that corresponds to this service in cell a.

Table 42: Specification of the service "Authentication of user credentials"

InovWine	Service specification	
Name/identifier	Authentication of user credentials	**Id:** 1
Version	Number V0.1, date: 16th of March, 2011, author: Cristina Costa	
Goal	Provide access to InovWine features	
Description	The user, after signing in, can access the InovWine information system features through this service according to his/her profile	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC, Biocant, IPN, InovWine information system	
Input data and their source	Login *Password* This information is inserted by the users	
Output data and its target	The user profile that will be used by the InovWine information system	
Service dependencies	Registration of user	
Access control mechanisms	Non existent	
Business flows leading to the service	"Grapevines and vineyard data (treatments, annual reports, plagues…)" entered by the producers. It is relevant to know who inserts the data	
Reasons for its existence	Assure that only registered users have access to InovWine and provide information according to the users' profile	
Service restrictions	The producers must be ACC members It is mandatory to fill in all the required fields	
Information system support	The information system must have a password encryption mechanism. When a user signs in, his/her profile is checked to identify the functionalities assigned to that user A smartphone or a browser can be used to access the service	
Remarks	No remarks	

After a successful login, the users can choose between two options: "Search" or "Insert data" (interface can be seen in Table 49, cell b). If the latter option is selected, then three other options will be made available to users: "Interventions", "Events", and "Field characteristics". There are four types of possible "Interventions" (interface in Table 49, cell c): "Phytosanitary", "Fertilization", "Pruning", and "Harvesting". In Table 43 we specified the fourth, using the service "Registration of harvest". We present the interface to enter harvesting data in Table 49, cell d.

Table 43: Specification of the service “Registration of harvest”

InovWine	Service specification	
Name/identifier	Registration of harvest	**Id:** 5
Version	Number V0.1, date: 16th of March, 2011, author: Cristina Costa	
Goal	Record data about the harvest operation	
Description	After a successful login, the users can search or insert data. In the latter option, they will have access to two options: “Interventions” and “Events”. “Harvest” is one of the available “Interventions”. The entered data will contribute to monitor the vineyard, to increase the knowledge about it, and support or tune the alarm generating mechanisms	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC, InovWine information system	
Input data and their source	Data about the vineyard being harvested Sensor(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) RFID(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) Vineyard area where the harvest took place Harvest time (start and end time) The total amount of grapes produced (kg) Alcohol degree achieved on the grapes Payment obtained by the grapes Notes of interest This data will be inserted by the producers	
Output data and its target	Non existent	
Service dependencies	Authentication of user credentials Registration of vineyard Registration of the sensor information (depends on the producer's acquisitions) Registration of the RFID information (depends on the producer's acquisitions)	
Access control mechanisms	The producers need to be identified through a login and password	
Business flows leading to the service	“Grapevines and vineyard data (treatments, annual reports, plagues…)” “Vineyard historic/historical data (biotic and abiotic factors)” “Grapevines historic/historical data (biotic and abiotic factors)”	
Reasons for its existence	Collect data to monitor the vineyard production. This will allow to tune the warnings, providing more reliable and useful alarms	
Service restrictions	The producers must be ACC members After the harvest being finished all the fields must be filled in. A possible exception is the field “Notes of interest” that depends on the need to record a particular situation	

InovWine	Service specification
Information system support	All the information concerning the vineyard's harvest must be included in the InovWine database Data on harvest contribute to enhance the monitoring of the vineyard. The combination of this information with other interventions on the vineyard (e.g., pruning, phytosanitary treatments, and fertilization) allows disclosing relationships between the vineyards' interventions and its evolution. All this contributes to improve knowledge extraction algorithms and therefore tune the warnings generation The data on the harvest should be editable A smartphone or a browser can be used to access the service
Remarks	The data obtained about the harvest can either be linked to one vineyard (if the owners did not acquire a wireless sensor network and RFIDs to monitor their vineyards), or to specific electronic devices (sensors or RFIDs) associated with a vineyard area

Three types of events are available in this application (Table 49, Cell e): "Disease", "Plague", and "Ripening state". We detail the services "Registration of disease" and "Registration of plague" in Table 44 and Table 45, respectively. Both services are presented, since they are complex, encompass a huge amount of information, and allow us to show the detail of the insights transmitted to the development team. The event data insertion is illustrated through the interface to enter plague data in Table 49, cell f.

Table 44: Specification of the service "Registration of disease"

InovWine	Service specification	
Name/identifier	Registration of disease	**Id:** 7
Version	Number V0.1, date: 18th of March, 2011, author: Cristina Costa	
Goal	Record diseases found in the vineyards	
Description	After a successful login, the users can search or insert data. In the latter option, they will have access to two options: "Interventions" and "Events". "Diseases" is one of the available "Events". The entered data will contribute to monitor the vineyard, to increase the knowledge about it, and support/tune the alarm generating mechanisms	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC, InovWine information system	

InovWine	Service specification
Input data and their source	Data about the vineyard where the disease was found Sensor(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) RFID(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) Disease identification (see the field "Remarks") Vineyard position where the disease was detected Disease time limits (the date when the symptoms were seen, and the date when they disappear) Photograph Notes of interest This data will be inserted by the producers or ACC
Output data and its target	Non existent
Service dependencies	Authentication of user credentials Registration of vineyard Registration of the sensor information (depends on the producer's acquisitions) Registration of the RFID information (depends on the producer's acquisitions)
Access control mechanisms	The producers need to be identified through a login and password
Business flows leading to the service	"Grapevines and vineyard data (treatments, annual reports, plagues…)" "Vineyard historic/historical data (biotic and abiotic factors)" "Grapevines historic/historical data (biotic and abiotic factors)"
Reasons for its existence	Collect data to develop disease monitoring services. This will allow to tune the warnings, providing more reliable and useful alarms
Service restrictions	The producers must be ACC members When the phyto-sanitary state of the vineyard achieves a safe condition all the fields must be filled in. Possible exceptions are the field "Photograph and "Notes of interest". The latter depends on the need to record a particular situation
Information system support	All the information concerning the vineyard diseases must be included in the InovWine database Data on diseases contribute to enhance the monitoring of the vineyard. The combination of this information with other events on the vineyard (e.g., plagues, and ripening state) and interventions (e.g., harvest, pruning, phytosanitary treatments, and fertilization) allows disclosing relationships between the vineyards' events and its evolution. All this contributes to improve knowledge extraction algorithms and therefore tune the warnings generation The data on the diseases should be editable A smartphone or a browser can be used to access the service

InovWine	Service specification
Remarks	The data obtained about diseases can either be linked to one vineyard (if the owners did not acquire a wireless sensor network and RFIDs to monitor their vineyards), or to specific electronic devices (sensors or RFIDs) associated with a vineyard area List of fruit and foliar diseases: • Black rot • Black spot • Mildew • Oidium • White rot • List of Wood and Root Diseases • Armillaria root rot • Esca • Eutypa dieback • Corky bark • Rupestris stem pitting

Table 45: Specification of the service "Registration of plague"

InovWine	Service specification	
Name/identifier	Registration of plague	**Id:** 8
Version	Number V0.1, date: 18th of March, 2011, author: Cristina Costa	
Goal	Record plagues found in the vineyards	
Description	After a successful login, the users can search or insert data. In the latter option, they will have access to two options: "Interventions" and "Events"."Plagues" is one the available "Events". The entered data will contribute to monitor the vineyard, to increase the knowledge about it, and support/tune the alarm generating mechanisms	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC, InovWine information system	
Input data and their source	Data about the vineyard where the plague was found Sensor(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) RFID(s) installed in the vineyard (this information is optional, depends on the vineyard alarm system) Identification of the plague (see the field "Remarks") Vineyard position where the plague was discovered The plague occupation time (start and end time) Photograph Notes of interest This data will be inserted by the producers	

InovWine	Service specification
Output data and its target	Non existent
Service dependencies	Authentication of user credentials Registration of vineyard Registration of the sensor information (depends on the producer's acquisitions) Registration of the RFID information (depends on the producer's acquisitions)
Access control mechanisms	The producers need to be identified through a login and password
Business flows leading to the service	"Grapevines and vineyard data (treatments, annual reports, plagues…)" "Vineyard historic/historical data (biotic and abiotic factors)" "Grapevines historic/historical data (biotic and abiotic factors)"
Reasons for its existence	Collect data to develop disease monitoring services. This will allow to tune the warnings, providing more reliable and useful alarms
Service restrictions	The producers must be ACC members When the vineyard is free of plagues all the fields must be filled in. Possible exceptions are the field "Photograph and "Notes of interest". The latter depends on the need to record a particular situation
Information system support	All the information concerning the vineyard plagues must be included in the InovWine database Data on plagues contribute to enhance the monitoring of the vineyard. The combination of this information with other events on the vineyard (e.g., diseases, and ripening state) and interventions (e.g., pruning, phytosanitary treatments, and fertilization) allows disclosing relationships between the vineyards interventions and its evolution. All this contributes to improve knowledge extraction algorithms and therefore tune the warnings generation The data on the diseases should be editable A smartphone or a browser can be used to access the service
Remarks	The data obtained about plagues can either be linked to one vineyard (if the owners did not acquire a wireless sensor network and RFIDs to monitor their vineyards), or to specific electronic devices (sensors or RFIDs) associated with a vineyard area List of vineyards plagues: • Grape erineum mites • Grape moths (e.g., Pyrale, Cochylis, and Eudemis) • Margarodes vitis • Phylloxera • Spider mites (e.g., red mite and the yellow mite) • Snails

In addition to the data captured by the sensor nodes and entered by the producers on their vineyards, it is also fundamental for the system to record information on: InovWine users, the characteristics of the vineyards, as well as sensor nodes and RFIDs features. As an example, we detail the service "Registration of the sensor node information" in Table 46. The position of the sensors in a vineyard is illustrated through the interface in Table 49, cell g.

Table 46: Specification of the service "Registration of the sensor node information"

InovWine	**Service specification**	
Name/identifier	Registration of the sensor node information	**Id:** 9
Version	Number V0.1, date: 22sd of March, 2011, author: Cristina Costa	
Goal	Record all sensor nodes used by the InovWine information system	
Description	After users' authentication, they can access to the option "Update existing devices" that records data about the sensor node. The entered data will contribute to perceive the different points of analysis	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC, InovWine information system, and the vineyard devices' maintenance team (IPN or a spin-off)	
Input data and their source	Identifier of the sensor node Sensor node brand Number of sensors per node Installation date Warranty length Notes of interest Last maintenance date Node geographic position Identification of the vineyard where the node is installed Abiotic factors collected (for an initial idea, see field "Remarks") Identification of the node owner (may be a producer or ACC) General description of the point where the node was installed This data will be inserted by the IPN, or by the spin-off responsible for the maintenance of the electronic devices installed in the vineyard, or by the producer that acquires the node (this topic is under discussion)	
Output data and its target	Non existent	
Service dependencies	Authentication of user credentials Registration of vineyard	
Access control mechanisms	IPN, the spin-off, or the producers should be identified through a login and password	
Business flows leading to the service	"Monitoring and alarm system service"	
Reasons for its existence	Know which nodes are associated with each vineyard facilitates its maintenance. This data will be used by the several searches available and will help to tune the warnings	
Service restrictions	As mentioned in Table 28, in the field "Existing rules", the electronic equipment must be discretely installed in the vineyards, in order to avoid thefts	

InovWine	Service specification
Information system support	All the information concerning the node sensors must be included in the InovWine database The InovWine information system should be developed to allow an easy maintenance of the devices in the vineyard, during and after the project The data on the node sensors should be editable A smartphone or a browser can be used to access the service
Remarks	List of sensor relevant to monitor the vineyard (according to the ACC and the Meteorological Station of Bairrada): • Temperature (maximum/minimum) • Humidity (air, soil, and leaf)) • Precipitation • Wind speed • Radiation They were already installed in the vineyard

Due to its wealth of information (it gathers climate, biological, and logistic information on the producers, as well as on the vineyards), the InovWine system promotes data cross-checking and enables relevant searches. For instance, InovWine users can look for data on the producers, on the installed devices, on a set of grapevines, or on the vineyards. All this information is intertwined (e.g., when searching for producers the information on their vineyards must be accessible; when consulting data on the vineyards it is important to know about the devices installed in the properties). To exemplify possible searches, we detailed the service “Search for information about the vineyard” in Table 47. When a user decides to search data on his/her vineyard three options will be available: “Alarms”, “RFIDs”, and “History” (the interface that corresponds to this choice is shown is Table 49, cell h). For a particular vineyard, the first option presents the alarms issued, the second the data associated with each RFIDs, and the third the history. The vineyard history can include information so diverse as events, interventions, or climate statistics (a graphic on the air temperature in a particular time period is shown in Table 49, cell i).

Table 47: Specification of the service “Search for information about the vineyard”

InovWine	Service specification	
Name/identifier	Search for information about the vineyard	**Id:** 18
Version	Number V0.1, date: 22sd of March, 2011, author: Cristina Costa	
Goal	Find relevant information about the vineyard	
Description	After users’ authentication, they should go to the “Search” menu and access the option “Vineyards”	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC	

InovWine	Service specification
Input data and their source	Vineyard identification This data is entered by the producer or by the ACC
Output data and its target	Information on the vineyard: its owner, terrain characteristics, interventions and events, genotyping data, phytopathogenic elements, devices installed in the vineyard, and statistical analysis of all this information This data is mainly searched by ACC and the producers
Service dependencies	Authentication of user credentials Registration of user Registration of vineyard Registration of the sensor node information Registration of the RFID information Registration of phytosanitary treatment Registration of pruning Registration of fertilization Registration of harvest Registration of grape ripening Registration of disease Registration of plague Registration of detected phytopathogenic Registration of the variety genotype Registration of the data captured by the sensor Registration of the data obtained with the RFID Generate warnings
Access control mechanisms	The users need to be identified through a login and password
Business flows leading to the service	“Grapevines and vineyard data (treatments, annual reports, plagues…)”) “Vineyard history” “Grapevine history”
Reasons for its existence	Record all data that may influence vineyard production Gaining knowledge to make best use of the vineyard and consequently to increase its profitability
Service restrictions	The producers must be ACC members Each producer should only have access to data from his/her vineyards The field that identifies the vineyard is required to perform the search
Information system support	This consultation mechanism requires access to the information recorded by the various InovWine services (it is necessary to consider data introduced by the producers, automatically transmitted by the sensors, and recorded through RFIDs about specific areas of the monitored vine) A smartphone or a browser can be used to access the service The searched data, in addition to being available through the search options can also be presented resorting to augmented reality
Remarks	The outcome of this service can promote the actors participation

Due to its relevance to the InovWine business model, as a last example we also present the "Generate warnings" service (Table 48). This service highly depends on the remaining services and is available in two scenarios: a set of grapevines or the entire vineyard. If this service will be able to reduce the treatment expenses and increase the grape quality, it will strongly contribute to the success of this venture.

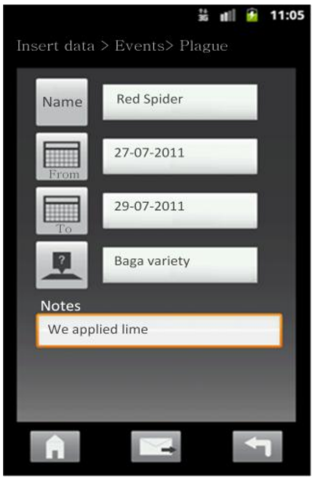
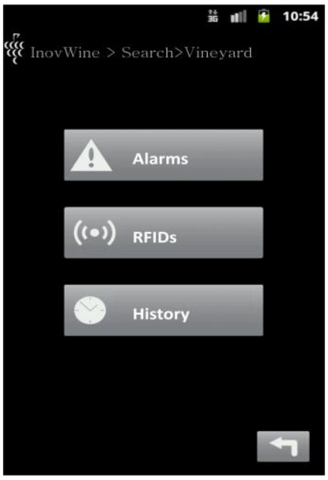
Table 48: Specification of the service "Generate warnings"

InovWine	**Service specification**	
Name/identifier	Generate warnings	**Id:** 21
Version	Number V0.1, date: 27th of March, 2011, author: Cristina Costa	
Goal	Give treatment advices to producers	
Description	After users' authentication, they should go to the "Search" menu and select if they want to verify alarms for a vineyard or for a set of grapevines. The warnings generated about those areas will be made available Due to the lack of technological skills, the warning generated by the InovWine information system should also be transmitted by voice. If the producer does not pick up the call, another one should be made according to a defined timetable	
Actor that provides the service	InovWine information system	
Actor that uses the service	Producers, ACC	
Input data and their source	Producer identification, or ACC This data is entered by the producer or by the ACC. The latter for reasons of control	
Output data and its target	Warning messages relevant to the vineyard treatment This data is mainly important to the producers and to ACC	

InovWine	Service specification
Service dependencies	Authentication of user credentials Registration of user Registration of vineyard Registration of the sensor node information Registration of the RFID information Registration of phytosanitary treatment Registration of pruning Registration of fertilization Registration of harvest Registration of grape ripening Registration of disease Registration of plague Registration of detected phytopathogenic Registration of the variety genotype Registration of the data captured by the sensors Registration of the data obtained with the RFIDs
Access control mechanisms	The users need to be identified through a login and a password
Business flows leading to the service	"Monitoring and alarm system service"
Reasons for its existence	Optimize the vineyard production and improve wine quality
Service restrictions	The producers that enter the data must be ACC members Each producer should only have access to data from his/her vineyards
Information system support	This consultation mechanism requires access to the information recorded by the various InovWine services (it is necessary to consider data introduced by the producers, automatically transmitted by the sensors, and recorded through RFIDs about specific areas of the monitored vine) A smartphone or a browser can be used to access the service The searched data, in addition to being available through the search options can also be presented resorting to augmented reality
Remarks	This service is essential for producers to join the InovWine project

Below, in Table 49, we present some of the created interfaces. They illustrate how the InovWine information system presents some of the specified services to its users. The selected design attempted to answer the actors' difficulties in dealing with technological devices (e.g., a reduced number of options per display, large fonts, and space between options).

Table 49: InovWine information system interfaces

Interfaces		
a – Authentication of user credentials	b – Pathway decision	c – Type of interventions
		
d - Harvesting data	e – Type of events	f – Plague data
		
g- Sensors position	h – Vineyard search	i – Historical graphics
		

A web version of the above services was also developed. To illustrate some of the work carried out we present in Figure 56 two interfaces: on the left side of the figure we can observe details on the vineyard and on the right side analysis on the sensors' data.

Figure 56: Web interfaces developed

7.2.13 Findings after the second BIZ2BIS iteration

After several changes made in response to problems highlighted by BIZ2BIS, we achieved a version of the business model, as well as its underlying information system, endorsed by the actors. Below, we discuss the contributions of this iteration of BIZ2BIS:

- The economic difficulties of the producers led us to propose the development of a network with a larger mesh, able to cover all producers' lands, and shared by them, instead of considering that each would acquire its own network. The development team designed this network according to critical points of analysis identified in the cooperative vineyards. To minimize the problems associated with the financial constraints and obtain more attractive prices, we suggested the management of collective and larger scale purchases of equipment to the cooperative. In addition, we highlight the possibility of financially exploiting the InovWine database. The collected data can be an interesting source for research on precision agriculture for some entities (e.g., IPN and Biocant).
- The lack of technological skills made us establish the need to promote training actions to fight technological illiteracy. The cooperative showed interest and determination in supporting these initiatives. To minimize potential usability problems, we advised the development team to include the producers in the test phase of the InovWine information system. We also recommended that the warnings provided could be transmitted through phone calls instead of the originally considered text messages.
- BIZ2BIS supported the choices of the actors with power of decision with a thorough knowledge of the networked business model. We described the network, identified its actors, their context, interactions, vested interests, expectations and difficulties, carried

out activities, established collaborations, and factors that could encourage the alignment of interests among the actors. We also took into account alternative scenarios to increase the responsiveness of the business model for future opportunities and threats.

- BIZ2BIS enabled us to pay special attention to actors and value propositions critical to the business model. In order to identify activities whose accomplishments were not assured and value propositions at risk, we traced the flows whose absence could jeopardize the business model. Then, we looked for alternative scenarios that could minimize the detected threats and avoid the network collapse. For instance, the business model underwent several adjustments to mitigate the financial burden of the producers and encourage their participation. Furthermore, we pointed out solutions to make the task of entering data easier and less laborious (e.g., training and usability requirements).
- The indications we got from BIZ2BIS allowed us to iteratively refine the InovWine business model. When we stopped to detect aspects that could be improved, we assessed whether the objectives of the actors were being met. Since, in our view, the value propositions made available were in line with the expressed interests, we put this version of the business model forth for the approval of the actors. According to their own perception, the balance between the gain obtained and the effort expended was positive for all involved. The results confirmed the previous findings, strengthened the idea that we reached a satisfactory alignment between the various coexisting interests and gave us additional assurances about the willingness of the actors to maintain their presence in the network.
- BIZ2BIS also supported the identification of the list of the services that the InovWine information system should make available. This contribution revealed itself extremely helpful to the development team. Its members neither participated in the meetings to discuss the business model, nor in the negotiations that gave rise to adjustments in the business model. However, supported by our BIZ2BIS report, they were able to develop the information system underlying the business model. The content of the document was clear and informative. We only needed one meeting to clarify less obvious aspects. In this encounter, it was also possible to obtain feedback about the suitability of the developed artifacts. No major suggestion was made to us. They considered the information and the provided artifacts self-explanatory, with precise guidelines, therefore easy to follow.
- The development team presented the user interfaces created for the InovWine information system in several meetings with the cooperative and the producers. They were pleased with the work done and only suggested minor aesthetic changes. Noticing the potential of the system, they made requests to introduce new features. However, these solicitations were impracticable due the need to purchase very expensive sensors, not covered by the project funds. The positive reaction highlighted the idea that BIZ2BIS was able to integrate the actors' aspirations and the cooperative context in the business model study. Furthermore, it strengthened BIZ2BIS' ability to translate the

business model, including its social factors, into the high-level requirements of its information system.

- The prospection of future scenarios in collaboration with practitioners (e.g., use of RFIDs in the grapevine certification process and increase the density of sensors in vineyards with high quality grapes) enhanced our understanding of the wine field. The gained knowledge led us beyond the scope of the business model under study, which gave us the chance to show how InovWine could open new opportunities to its actors.

7.3 Conclusion

This chapter illustrates how our proposal – BIZ2BIS – can be applied to a concrete networked business model, using the InovWine project as an example. Action research guide our work, which allowed us to chronicle actions carried out and reflect on relevant outcomes for the business model scientific domain and to practitioners of the wine sector.

We started by applying *Phase I* of BIZ2BIS to the InovWine business model described in the proposal submitted to NSRF in order to characterize its network and detail its actors. To complement it, we developed efforts to enhance our knowledge on the wine sector, in particular in the Bairrada Region: we studied the business model in use prior to InovWine Project, compared it with the one in the proposal, established contacts to understand the expectations of the actors, and consulted several sources of information (magazines, Internet resources, books, and technical reports). The acquired knowledge enhanced our ability to detect situations that could jeopardize the wine production and compromise the business model adoption. Therefore, we moved on to *Phase II* and, in collaboration with practitioners, detailed the identified problems and sought indications for their resolution. Then, we presented our proposals to the actors with the power to decide the future of the networked business model. They supported our ideas and, with their consent, we started to detail the new envisioned solution. We described how the goals of each actor could support the aims of the networked business model and disclosed possible collaborations among the actors. Then, we carried out a continuous process of negotiation and ongoing capture of information that provided clues on how to enroll the actors based on the roles defined for them. By carrying out the required adjustments, and accessing new data, we updated the artifacts of *Phase I* and *Phase II* several times, and considered alternative scenarios for the business model. When we obtained indications that a possible alignment had been achieved among the interests of the actors in *Phase II*, we advanced to *Phase III* and asked the actors to evaluate our proposal. Since their feedback was clearly positive, we advanced to *Phase IV* and used the outcomes gathered up to that point to specify the high-level requirements of the services that the underlying information system of the business model should provide. They have been used to guide the subsequent development of the InovWine information system by an independent team. In the meetings held to evaluate the application prototype, we obtained extremely positive feedback from the ACC, its producers, and Biocant.

The InovWine project underlined BIZ2BIS' potential to discuss, design, and evaluate networked business models from a socio-technical perspective. It guided us in understanding the business model originally proposed, discussing it, discovering its weaknesses, proposing alternative solutions, always in collaboration with practitioners. It put us at the service of the context of study, integrating the views and expectations of those involved, and assigning them a relevant role in the assessment of the solutions to adopt. In turn, their involvement commits them with the decisions taken and gives us additional indicators of their interest in maintaining their participation in the networked business model. The insights obtained with the detailed study of the business model and of its context also aided us in successfully translating the obtained outcomes into the high-level requirements for its supporting information system.

Last, but not least, we will conclude this thesis by analyzing the developed work and discussing the research contributions for the proposed research questions. At this time, implications will be drawn for future research.

Chapter 8

Conclusions

We start by providing an overview of the problem space of this thesis. Then, we revisit the research questions and discuss how and to which extent these have been addressed. Subsequently, we describe our research contributions. We end by discussing the main limitations of our work and directions for further research.

8.1 Overview of the problem statement

Technological advances and the generalized use of the Internet have changed the playing field for companies. Several actors can now come together in network configurations to create innovative business models that would be unfeasible in the physical world. However, the more radical the departure from the established models of value creation, the bigger the complexity in analyzing those environments. Participants in the same network can be allies in the pursuit of a set of goals, and, simultaneously, be competitors in the pursuit of others (Gulati et al., 2000). Their relationships in the network are supported by a sensitive balance of interests, which raises difficulties in ensuring the sustained involvement of the parties and the stability of the forged bonds.

Based on the literature review, we noticed that most of the proposals in the business model domain did not focus on the study of business networks, but rather on individual organizations. There were no indications on how to introduce the specificities of the network in the business model study (e.g., collaborations, dependencies, conflicts, or joint value propositions). We recognize the importance of avoiding a myopic look that ignores the multiple interrelations and entanglement that characterizes a network space. Therefore, we translated the lenses of analysis proposed by Law to our study in order to improve our knowledge of networked business models and open new possibilities of analysis. This option led us to complement business model theories with influences from the social domain, in particular ANT (presented in Chapter 3).

ANT inspired us to perceive and conceptualize business models as a heterogeneous reality built of multidimensional and continually evolving entanglements, in which a collective of human and non-human actors interact. This alternative outlook gave us the chance to consider the socio-technical nature of business models potentiated by ICTs. By denying that purely social or technical relationships are possible, ANT created distinctive and promising conditions for exploring the interdependency between information systems and the networked business models in which they operate. It aided us to conceive new forms of thinking information systems and perceive how they are influenced by, and how they influence, business contexts.

Based on the ideas laid out above, we formulated the following research purpose:

> *The purpose of the thesis is to develop an approach to discuss, design, and evaluate business models in network configurations, which will equally contribute to disclose its underlying information system requirements. By exploring the socio-technical nature of networked business models, the approach aims to be used as an effective means to guide the search towards beneficial arrangements of value propositions that can lead to stable networks.*

To meet this overall purpose, two research questions were introduced in Chapter 1. In the next subsection, they are revisited in the light of the obtained results.

8.2 Reviewing the research issue

The business model literature review (Chapter 2) allowed us to identify the topics usually addressed by this domain. We noticed that the concept of value proposition acquired a prominent role in the available definitions, and that others like business architecture, revenue sources, network partnerships, business actors, roles, and resources were also common. In the topic of business components, the organization value propositions, financial aspects, target customers, distribution channels, customers' relationships, network of cooperative agreements were common denominators. The available business representations confirmed the relevance of the mentioned elements. Most of the contributions we analyzed address the business model of a company. They may consider the partnerships established by a given company, but the organization remains the most important reference point, not the networked business model as an entity that co-creates value.

We used the acquired background as a starting point to move our analysis beyond a company's boundaries. In alternative to a viewpoint centered in one organization, we decided to focus our attention on business models operating in network configurations, on their innovative possibilities to co-create value, and on the challenges that these configurations pose (e.g., align the distinct interests involved). This research direction was supported by the literature on business models in network configurations. The available contributions underlined the need to address issues not yet covered, such as the dependencies among network actors, negotiation mechanisms able to align their individual interests, joint efforts to create value, or transaction of items of unequal value. The inherent complexity of network settings strengthened the importance of obtaining a comprehensive view of the business model context. Despite the significance assigned to the social dimension by some authors, no indications on how to address it were apparent.

The identified open issues in the business model domain coupled with our interest in exploring ANT's potential in this field led us to formulate two main research questions: RQ1 and RQ2.

RQ1. How can the discussion, design, and evaluation of business models in network configurations benefit from ANT's contributions?

As research progressed, we clarified and detailed lines of study, which allowed us to refine RQ1 in five sub-questions.

a. How to account for socio-technical aspects in business models?

We claim that if we wish to understand business models, then we need to explore the relationships that reside in their networks. ANT aided us to see space as networked-oriented and pointed out the importance of exploring it. Its insights encouraged us to follow the actors and to describe their actions and attitudes, even the irrational ones, based on the traces they leave in their interactions. Influences to those actions are also exposed (e.g., personal interests or conflicting positions). ANT's vocabulary, rather than describing the network translations in sanitized accounts, gathers all their glorious messiness and irrationality (McMaster et al., 1997c). Its insights inspired us to improve the networked business model understanding, and thus address the emergence of controversies among actors, reveal scenarios that are not so obvious or clear, start inquiries on the basis of uncertainty, and disclose what can compromise or consolidate networked business models.

Neither networks, nor actors, nor their connections can be considered stable over time. ANT showed us that actors change, reshaped by the network(s) in which they have become enrolled. Even if the actors initially appear stable, it is important to consider the benefits that can be obtained by challenging some punctualizations. The concepts of translation and inscription acquired a relevant role in this endeavor. They inspired and guided us to perceive the aims of each actor, detect interests that could attract them, conduct negotiations to align their aims, inscribe programs of action, and strengthen their presence in the network. Their insights resulted in the development of sensitizing devices introduced in the approach.

Along the studied business scenarios, this research sub-question underwent a sequential evolution with strong implications on the modus operandi of the approach. In our first case study, HowMuchIsIt, we tried to find connection points with ANT. Its concepts of network, actors, and interactions fitted perfectly with the business model analysis and enhanced the knowledge on the network, capturing its social dimension. Encouraged by the established connections, similarly to what is done in the regular applications of ANT, we also tried to describe HowMuchIsIt's translation phases textually. A clear drawback was detected. The approach's dependency on notions from ANT, unfamiliar to most business analysts, would restrict its use. The Online Journal case study also highlighted this limitation. Resistance was still evident, even though there were efforts to introduce ANT in a more subtle way. Thus, we adopted a more defensive position. We maintained ANT's influences but in understated form. Our solution to this challenge was the development of artifacts with the capacity to integrate ANT's concepts in an enclosed form, which made the application of BIZ2BIS independent from their knowledge.

In GreenHomes, we applied the developed artifacts in collaboration with the project team. The provided feedback and the detected problems led us to the version of the approach initially used in InovWine. In this scenario, the already existing artifacts did not undergo significant changes. In most of the cases, the performed adjustments aimed at facilitating their analysis. To enhance the representation of dependencies in the business model we created a new artifact and made additional features available. The complexity of the case and the actors' expertise showed us that following each actor's translations and attempts of inscription can be extremely rewarding to the business model understanding. We had the opportunity to challenge black boxes (e.g., grapevines certification process), disclose network boundaries, foster negotiation mechanisms towards the alignment of the involved interests, and propose alternatives that were actually put into practice.

b. How to identify the stakeholders and represent a networked business model so that it is clear to all involved?

We paid particular attention to this sub-question in InovWine. Our concept of actor was inspired by ANT heterogeneous networks and by the literature on stakeholder's definition (Freeman, 1984, Johnson and Scholes, 2002, Bryson, 2004). We used an inclusive outlook: each element that can influence, or be influenced, by the networked business model - directly or indirectly - should be regarded as an actor. To identify these actors in a networked business model, we applied one of the principles suggested by Pouloudi and Whitley (1997) to characterize the behavior of stakeholders and the snowball method (Hanneman, 2001). After identifying the initial actors, they are recursively asked (or observed) to identify all their connections. The business analysts should stop this iterative process when they are not able to identify new stakeholders or consider that they have a residual influence. The traces left in the iterative process of finding actors helped us to reduce the fuzziness of the network boundaries.

InovWine enabled us to experience the advantages of this procedure. We started with an initial set of actors. As these actors detected aspects that required data, or intervention from others, the network was expanded. Not all identified actors were included in the business model study, however, some (e.g., Viticert) provided relevant and pertinent data that enabled us to detect false initial assumptions, detail business model's activities, identify new actors, and disclose future opportunities. We constantly encouraged the actors to share their personal views, and, in doing so, they contributed to the business model enlightenment.

The capacity of our approach to incorporate the social component of the business models while also revealing the involved actors brought about a more comprehensive view of the networks. The chance to integrate the actors and their connections in the business model context created a background of knowledge that enabled a more accurate definition of the business model and the development of a common understanding. The shared perception built throughout the approach promoted the comparison and discussion of ideas and solutions among the actors.

The use of BIZ2BIS as a communication tool in GreenHomes and InovWine (where collaboration was best achieved) enhanced a common, more accurate understanding of the business model idea among actors. The gathered information and the performed analysis captured each actor's perception, enabling a multi-viewpoint that aided BIZ2BIS in dealing with the different interests involved. The approach used the obtained outcomes to explore the potential of the actors to the network, while simultaneously pointing out proposals able to create favorable conditions for their participation. In the search for an alignment among the interests of the actors, BIZ2BIS introduced into the business model discussion factors such as the actors' expectations, alternative features to address the actors' interests, or possible collaborations to enhance the attractiveness of the value propositions.

c. *How to create an approach capable of aligning the goals of the various stakeholders?*

In the Online Journal case study, the need to include a negotiation phase in the approach became evident. We felt it was necessary to understand how actors could be enrolled in the network, ensure that all ended up with attractive value propositions, all interests were aligned, and the stability of the bonds were strengthened. To meet these needs, we developed a negotiation mechanism that explores the possibility to assign new roles to the actors (modifying duties, work processes, and prerogatives) - placing them in a new position in the network state of affairs. The concepts of translation and inscription inspired us in this endeavor. Their definition helped us to develop a set of guidelines to disclose the actors' position towards the networked business model and detect possible threats. Furthermore, these concepts inspired us to seek alternatives that could mitigate problematic situations and lead to stable networks.

The guidelines defined for the business model negotiation were embedded in the approach's artifacts, which were progressively enhanced throughout its application. They address different particularities of the translation that were materialized in a flexible sequence of steps. On the one hand, the "Common goal diagram" and the "Actors/Goals affinity chart" identify the network's objectives, the aims of its actors, as well as forms of collaboration (topics influenced by the problematization and interessement). On the other hand, the "Negotiation diagram" searches iteratively for alignments among the actors, embracing the concept of enrolment. In GreeHomes, the artifacts allowed us to detect imbalances in the value propositions made available to one of the actors. We exposed our findings to the project leaders, who were receptive to our arguments. In InovWine, due to the possibility of intervening in the project, the impact of our outcomes was even more significant. When applying BIZ2BIS, we detected problems and proposed alternatives, some of which were later adopted by the actors with power to decide. The applied negotiation increased our awareness of the actors' fears and expectations and implemented a bottom-up mobilization of the actors. Major business model rearrangements were undertaken.

When actors' interests are stabilized, controversy is removed, and the programs of action are inscribed. However, the actors do not always act in the best interest of the group, nor in accordance with what is agreed. If an actor deviates, the alignment of the business model can be at risk, which should trigger an additional network analysis (and possibly supplementary negotiations). The network dynamics demands a constant monitoring.

d. How can indications about the business model stability be provided to stakeholders?

We believe that the business model evaluation cannot be confined to the traditional financial aspects most commonly addressed. We are convinced that non-monetized flows can also influence the organizations' interest towards the business model, as well as its viability. It would not be surprising to see companies providing services to prestigious organizations like NASA or Ferrari at a low cost, just to have them in their client portfolio. The evaluation component of BIZ2BIS was essentially explored in InovWine, which showed us that the value propositions provided to the several actors went beyond revenue streams. The two technological institutes provided their expertise and technology at very affordable prices to the wine making cooperative with the purpose of obtaining rights to the improvements carried out during the R&D project. The data owned by the cooperative on vineyards, its experience in the wine industry, and its availability and motivation to enhance its production made it a perfect candidate to implement the cutting edge technological solutions, otherwise financially unbearable. Other flows beyond the financial steams must be taken into account, as well their context. To restrict an evaluation to financial aspects can be a mistake, since they may imply the omission of relevant information for the business model sustainability.

Our analysis goes further and enriches the networked business model assessment with the notion that all parties value things differently, and often in an unequal way (Diamond, 2010). Several reasons support this kind of evaluation. The financial value assigned to a product or service is very volatile (what was established when conceiving the business model may not be valid after a month). The influence of intangible flows in the business model is also extremely difficult to quantify financially. The actors possess their own perception that must be taken into account. Something that can be extremely valuable for an actor, may not appeal to another. It is vital to respect the individuality of the actors and their own assessments to find out what each one values more (be it data, money, prestige, safety, or other type of flow), as well as the ones that can provide it.

Taking into account that the desertion of a relevant actor can lead to network collapse, we defined that the business model is stable and viable if the balance between the benefit and the exertion is positive for the participating actors. In BIZ2BIS, this validation is performed by the actors themselves and according to their own parameters. They use the artifact "Interview chart", which lists the business model value propositions available. For each one, the actors specify the effort they spend to support it, as well as their obtained gain. This assessment points out clues on the benefits that the actors will achieve with their participation and can expose situations of lack of interest. Indeed, their views, concerns, and voices improve our sensibility to understand how the idealized value propositions can be tuned to strengthen the business model chances of success. We also used the goals stated by each actor in the "Actor description chart" as a double check to establish if the value propositions provided by the business model were able to reach their goals and assure their satisfaction.

e. How to consider the dynamic nature of inter-organizational business models?

This thesis fully recognizes the dynamic and interconnected nature of networked business models and how it affects actions, inactions, and decision-making. ANT's perspective of time and space reinforced the notion that actors cannot be viewed in isolation and independent of their context and time frame, which instigated us to regularly review the business model dynamics when performing its analysis. ANT guided us into a world of associations and relations that brought together overlapping dimensions with influence in a particular action. By following the actors we integrated an omnipresent mechanism of exposing change and its causes in our approach. Moreover, as suggested by ANT, we regard each actor as a network in order to capture a broader perception of each ones individual scope. In this way, we endow the approach with an extra sensitivity to change.

ANT's concepts of translation and inscription also contributed to disclose the network complex relationships and detect changes in actors' positions over time. Both provided general indications that inspired us to perceive how actors in a networked business model are engaged into a dynamic negotiation, mutually translating each other in a black boxing attempt. We translated these indications and inscribed them in the approach's artifacts. They expose the actors will to capitalize on the weaknesses of the existing inscriptions, follow anti-programs and battle to achieve an alignment favorable to the interests of the actors, providing clues for future events and indications on proper ways to address them.

The business model dynamics was particularly felt in GreenHomes and InovWine. In the former, BIZ2BIS allowed us to detect problematic occurrences (e.g., the progressive lack of motivation of some actors) that could lead to the business model collapse. The setbacks were analyzed and different solutions based on identified opportunities were proposed with the aim of reorganizing the actors' participation. In the latter, we were confronted with an extremely dynamic scenario. Due to the constant changes, alternative business models were contemplated, and some of the initial aims were adjusted. The InovWine dynamics motivated us to reinforce the flexibility of the approach in order to take into account new actors, different value propositions, additional services, or amendments to the business model. The evolution of our knowledge during InovWine, as well as the unexpected changes, alerted us to the need of tracing the information in its successive versions. To illustrate this incremental development, we specified a notation to fill the artifacts "Networked business model scenario" and "Actor description chart", in which previous versions of the obtained information, incorrect assumptions, and new data are distinctly described.

Overall, RQ1 was addressed by emphasizing the nature of business models as multi-dimensional actor-networks. The application of ANT has been instrumental in opening the black box of business models in network configurations. The combination of business model theories and ANT (as well as other social influences) offered us a new look with potential to disclose what drives stakeholders to participate and get involved in the network. Using insights from these fields sharpened BIZ2BIS' ability to recognize problematic occurrences dangerous to the network stability and seek viable alternatives that may avoid an eventual disintegration.

RQ2. How can business model requirements (including its social context) be translated to its underlying information system specification?

Information systems projects continue to fail (Carbone, 2004) (Graham, 2008) and several researchers assign the responsibility for those failures more to social and organizational factors rather than technical ones (Doherty and King, 1998). Monteiro (2000) also emphasizes this point of view, arguing that the development and use of information systems development is a highly complex socio-technical negotiation process, where topics as diverse as political movements, power struggles, ethics, personal interests, standards, or resistance to change can affect it. We share these viewpoints and adopted them in our research.

BIZ2BIS enables the integration of social specificities and technical considerations in the description and analysis of business models. Moreover, by following the already established idea that information systems should be situated in a specific context of application (Suchman, 1987), it uses the description of business models as the starting point to specify the high-level requirements of their supporting information systems. In this translation, it presents the elicited requirements as a set of services, providing a common language for professionals of the business model and information systems domains. BIZ2BIS uses the services that support the value propositions enabled or enforced by technology to create a bridge between these value propositions and the internal processes carried out by the actors to make them available. This integrative perspective provided by BIZ2BIS clarifies the played roles and establishes patterns of behavior for the use of the information systems.

Inspired by ANT, we also explored the interrelated character of social and technical actors in BIZ2BIS, as well as the insights that can be achieved by treating them (human and non-human) equally. This line of analysis, created unique and favorable conditions of research, which offered us a privileged position to analyze the role and the impact of the business models on the information systems, and vice-versa. On the one hand, the achieved awareness on the networked business model exposes how human actors align their interests around technological elements and gives us clues to conduct future changes (Akrich, 1992) in the adopted solutions. On the other hand, given that inscriptions in the information systems transform them in actors imposing their programs of action (Monteiro, 2000), the specification of their high-level requirements enhances our understanding on their impact on the networked business model. It is important to underline that the inscriptions that can lead to network stability are usually the result of an iterative search for alignment of interests among the actors.

InovWine offered us a very enriching scenario to address this research question. We worked in direct collaboration with information system developers that depended on our outcome, which allowed us to explore the relationship between the business model and its information system. On the one hand, the approach was able to detect problems like the wine producers' technological illiteracy, the high rate of thefts in the vineyards where the technological devices should be deployed, or the producers' economical difficulties, which influenced the information system specification initially considered. For instance, in order to fight technological illiteracy and encourage the producers to use InovWine, we proposed the development of an add-on that whenever a new warning was available, the information system would make a phone call to producers alerting them to that fact, as opposed to forcing them to learn how to use the often not obvious SMS interface on their smartphones. On the other hand, the high-level requirements of the information system were also carried out with the purpose of inscribing a particular behavior in the network and in its actors. For instance, the insights of the monitoring and alarm system are only accessible for producers that entered their data.

8.3 Research contributions

The major contribution of this research is BIZ2BIS, an approach to discuss, design, and evaluate inter-organizational business models, while deriving the high-level requirements for their underlying information systems. It systematically helps scrutinize and tune the contributions and gains of the various actors to ensure that all of them will end up with attractive value propositions able to reinforce their continued commitment.

The approach is organized in four phases: the first identifies and characterizes the network's actors, as well as the structural aspects that influence their behavior. The second studies the network and, through an iterative negotiation, suggests eventual adjustments to ensure the alignment of the actors' interests. In the third phase, the stability of the resulting scenario is evaluated. The fourth uses the obtained insights to derive the high-level requirements for its underlying information system. The outcome is an aligned network of interests that documents all the business model interactions among the actors, their contributions, their gains, and that provides guidelines to the specification of the services that the information system underlying the business model must provide. In this section, we present our major theoretical and practical contributions.

8.3.1 Theoretical contributions

We contributed to the existing literature on business models by moving beyond the usual accounts of individual scenarios and focusing our attention on networked business model configurations. When analyzing a business model, we take into account the value propositions of each organization, but we do not limit ourselves to a compartmentalized view. We look at the network and how each actor can be valuable to others, and what others possess that may be considered valuable by the former. Moreover, we consider that actors can assess value differently and that the revenue streams are not the only measure of value creation. Most of the time, it results from a combination of efforts in which, for instance, financial aspects can be related to topics as diverse as prestige and brand recognition. The fertile combination of business model flows and contributions, which give rise to multifaceted interpretations by the actors, had two main implications in BIZ2BIS: understanding how these flows could be arranged to capture and co-create value and the importance of developing an evaluation mechanism with the capacity to integrate each actor's perception.

The complexity of network configurations strengthened the importance of integrating social aspects in the study of business model scenarios. As others, (Morgan, 1986, Lyytinen and Damsgaard, 2001), we argue that social reality cannot be reduced to a small set of discrete variables (such as power, influence, technical know-how, available funds, values, beliefs, norms, or rituals), and that complex systems are historically situated and depend on context and time. To integrate this perspective in BIZ2BIS, we complemented insights from the business model domain with social influences. This choice introduced in our research the social context of the network and of its actors, which allowed us to look at a business model as a multiplicity of overlapping dimensions and brought into play a broader view. Our main influence, ANT, also took us further in understanding how business models can shape their supporting networks. Its guidelines to follow and identify the business actors aided us to unveil connections and helped us to clarify the network boundaries. Using the definitions, taxonomies, components and representations in the business model literature as a starting point, we integrated ANT's ability to disclose and detail relationships in the specification of the business model dimensions. Furthermore, ANT's concepts of translation and inscription showed us how actors form alliances or come into conflict, which inspired us to innovate and create a negotiation mechanism to manage the different interests that co-exist in a networked business model.

The developed negotiation mechanism supports the search for network stability. It endows BIZ2BIS with sensitizing devices that try to enroll actors in the business model, tune less satisfactory solutions, reach network alignment, and anticipate and cope with emergent problems. When this happens, we present the adopted solution to all the involved actors and ask for their assessment. Due to the impact that the actors' abandonment might cause in the network, our evaluation attributes a high importance to their own perceptions and takes into account their individual expectations. Furthermore, we consider it fundamental to involve the actors in the business model conceptualization, as well as in the specification of its supporting information systems.

The relationship between business models and information systems is underrepresented in the literature (Bouwman et al., 2012). Clear advantages can be obtained by establishing connection points and detecting influences between both (Chan and Reich, 2007). Taking into account the wealth of information collected by BIZ2BIS, we gathered promising conditions to expose the connections between these two domains and explore their combined efforts. We used the concept of service to translate the data obtained about the business model into high-level requirements that should be met by its information system. The concept of service helped us to perform this translation. It allowed us to establish a point of contact between the value propositions made available and the internal business processes supported by the information system. ANT's ability to regard non-human actors and observe how they affect and are affected by humans, as well as its concept of inscription also inspired us to detail the relationships between the two domains and investigate their dependencies.

"Theory is both a way of seeing and a way of not-seeing" (Walsham, 1993). It leads our way in certain directions, but at the same blinds us to others. Our research combines several theories. As mentioned, we complemented business model theories mainly with ANT, but

Structuration Theory also influenced us. The main difference between both is their socio-technical stance (in Structuration Theory technology's ability to make a difference is unacknowledged). Their combination is not a novelty and can be consulted for instance in (Walsham, 2001, Macome, 2002, Brooks and Atkinson, 2004, Naidoo, 2008). However, our contribution is related to how they can be applied in an innovative way to the business model domain. In networked business model scenarios, Structuration Theory was used to guide a broader social analysis and ANT to detail socio-technical connections. Structuration Theory's capacity to describe a context and regard how it influences the actions of humans, together with the ANT's aptitude to analyze relationships among actors, provided a new background of analysis.

The experience of adopting an interpretive approach and the sequential combination of two research methods (Morse, 2003): case study and action research, is another contribution of this research. The actions carried out and the choices made can be used for others who wish to apply this strategy. The diversity of the scenarios under study was also enhanced by the study of past and ongoing projects.

When looking at Pateli and Giaglis work (2004), we propose the inclusion of two extra dimensions to their framework (discussed in section 2.1) to encompass the requirements of a network configuration. The first should cover the negotiations that must be carried out among the actors involved in these environments, while the second should cover the dependencies between business models and their information systems. Furthermore, in contrast to what is often assumed in literature, the evaluation should go beyond financial streams.

The work we developed has as its outcome the list of publications presented below:

- Costa, C. C. and Cunha, P. R. d. 2010, Who are the players? Finding and characterizing stakeholders in social networks, 43 Hawaii International Conference on System Sciences, Kauai, Hawaii, 4-7 January.
- Costa, C. C. and Cunha, P. R. d. 2009, Business Model Design from an ANT Perspective: contributions and insights of an open and living theory, In Value creation in e-business management, 15th Americas Conference on Information Systems (selected papers) (Eds, Nelson, M. L., Shaw, M. J. and Strader, T. J.) Springer, San Francisco, USA, pp. 56-67.
- Costa, C. C. and Cunha, P. R. d. 2009, Happy actors, lasting Relations: how to design a sustainable inter-organizational business model, Pacific Asia Conference on Information Systems, Hyderabad, India, 10-12 July.
- Costa, C. C. and Cunha, P. R. 2008, Reducing uncertainty in business model design: a method to craft the value proposal and its supporting system, 16th European Conference on Information Systems, Galway, Ireland, 9-11 June.
- Costa, C. C. and Cunha, P. R. d. 2007, Towards an approach to assist business model and supporting information system design, European and Mediterranean Conference on Information Systems, Valencia, Spain, 24-26 June.

- Costa, C. C. and Cunha, P. R. d. 2007, Business model design for complex value networks using inputs from management, IS, and social theories, 15th European Conference on Information Systems - Doctoral Consortium, St. Gallen, Switzerland, 7-9 June.
- Costa, C. C. and Cunha, P. R. d. 2006, Specification of business models using social theories: actor-network and Structuration Theory, 1st Mediterranean Conference on Information Systems - Doctoral Consortium, Venice, Italy, 4-8 October.

8.3.2 Practical contributions

The contact with business practitioners showed us their difficulties in representing, analyzing, and evaluating business models operating in network configurations. These professionals were eager for practical guidelines capable of creating a common background of knowledge that could help them to improve communication and understanding among the actors of the business model. Above all, they wanted to perceive the complexity of the existing relationships, the phenomena of cooperation and competition, and obtain clues about the viability of their ideas. Furthermore, there was a tendency not to regard the social and organizational dimension of information systems and to remove them from their context. The resulting partial view hinders the correct specification of their high-level requirements.

BIZ2BIS, throughout its four phases sought to answer the identified expectations. In the previous section, we already discussed its theoretical influences and contributions. Now, we will underline how its standardized outlined plan can guide its future users in their activities of discussion, design, and evaluation. Our aim was to make the business model study as independent as possible from the intrinsic capabilities of the analysts. Furthermore, we conceptualized the approach to be used by others than analysts. By not demanding to its users the acquisition of knowledge outside their area of expertise (the theoretical influences used in BIZ2BIS were integrated in an understated form) we made it accessible to them and promoted their collaboration.

The application of BIZ2BIS is well documented and exemplified in this thesis, gleaning knowledge for others who wish to employ it. Through its application practitioners have the chance to:

- Describe in detail the network and its actors, defining the networked business model boundaries with some assurance. It provides the necessary tools to bring the business model’s context to its study, enriching its vision and the gathered knowledge.
- Include the actors’ individual perceptions in the network analysis to deal efficiently with the different interests of the involved actors.
- Apply an iterative negotiation mechanism that seeks the alignment of the actors’ interests, so that each can find an attractive and sustainable value proposition able to ensure that all the involved have an enticing reason to participate.

- Point out incompatibilities, inconsistencies, problems, and threats that may compromise the network and lead to its collapse. The obtained insights provide clues on alternative business model configurations that can be used to tune the present solutions and explore future options.
- Involve the actors in the conceptualization of the business model and in the assessment of the provided value propositions. To integrate a broader view of the interests that motivate the actors (e.g., prestige, scientific knowledge, and data), the evaluation of each one goes beyond the usual financial issues.
- Provide a comprehensive outlook of the networked business model to the actors with power to change it, supporting their assessments and choices.
- Enable the description of the business analysts' knowledge throughout the case, as well as of the proposed solutions.
- Document in detail the business model. Its actors' roles, their interactions, performed activities, and value propositions, to specify high-level requirements that ultimately should be met by the information system.
- Establish a link between business models and information systems. BIZ2BIS translates the outcomes of the devised business model description into the high-level requirements of its information system. It presents for each identified service the reasons for its existence, how it should be used, its scope in the network, and technical considerations. The obtained outcomes allow information system practitioners to obtain an inclusive view of the solutions to implement in the business context. The enriched view conveyed to practitioners provides additional guarantees about the possibilities of implementing solutions that in fact answer the needs of the network and of its actors.

The above points were addressed in the scenarios we studied (in whole or in part). In InovWine, the interest of the actors in creating favorable conditions to the success of the post-InovWine project and the collaboration established with the practitioners allowed us to explore the full potential of BIZ2BIS. Taking into account the actors demands and needs, we found problems in the business model initially proposed. Therefore, we presented alternative solutions, intervened to minimize them, and made the business model evolve, enhancing its viability. We also used the gathered knowledge for deriving the high-level requirements of the information system to be deployed, boosting its chances of adoption.

At the end of this thesis, BIZ2BIS can be viewed as an actor and its employment as an emergent attempt of black boxing a networked business model. However, like any other actor it is subject to the translation of others, who, will certainly find weaknesses in the performed inscriptions and, hopefully, will use them to enhance "our" proposal.

8.4 Limitations

We now reflect on the limitations of our work. Firstly, we were in an initial stage of the research when we started studying the HowMuchIsIt and the Online Journal business models, which limited our capacity to fully exploit these scenarios. These two, as well as GreenHomes, were interrupted due to circumstances beyond our control and restricted our access to practitioners' feedback. Despite the impossibility to address all the ideas, proposals, and actions initially planned, the three case studies clearly contributed to the gradual evolution of BIZ2BIS.

Secondly, in InovWine, we had the chance, and freedom, to follow the actors, create close relationships, open black boxes, influence decisions, and act in the networked business model. Our study made it clear that the original business model was unviable and provided indications of possible alternatives. Our suggestions were validated and accepted by the involved actors, which gave rise to a common feeling that a better solution was achieved. However, business models are themselves an on-going "ecosystems", and in spite of the positive feedback the updated version of InovWine is still being implemented, which makes the assessment of its success unfeasible. Furthermore, the presentation of our report does not imply that the actors involved have stopped modifying or introducing new programs of action - changes posterior to our study can influence the business model accomplishments. InovWine would benefit from a longitudinal analysis, but within the relatively short time period of a PhD thesis it is not always possible to find the perfect case or return to it whenever, and however, the researchers intend to. Practical feasibility will most of the times remain an issue in any research design.

Thirdly, it is impossible to assure that the obtained business model outcomes are absolutely unbiased. As the researchers try to comprehend what is observed, their personal values, ideologies and a priori knowledge will invariably intrude the observations and the achieved findings (Baskerville, 1999). However, to understand the business model, it is necessary to acknowledge the complex realities that can influence it. It is fundamental to dig "inside" it, regard the different interpretations, and disclose vital interplays that can influence it. In an attempt to minimize possible glitches, the actors validated all the proposed value propositions to the business model. Their involvement encourages collaboration between business model analysts and practitioners of a specific domain, facilitating and supporting necessary adjustments.

8.5 Directions for future research

On the basis of what we presented, it is important to discuss how the work we undertook can be useful for future research on networked business models. The recognized limitations provide a starting point for further studies.

First, we think it would be interesting to revisit InovWine and study its developments after 2011. To perceive how its business model has been actually applied would enhance our knowledge about the suitability of the approach and of the proposed solutions to address the detected problems. Furthermore, towards the end of writing this thesis, we knew that our suggestion to foster cooperation with big producers was followed and was taking its first steps. The parallel application of a similar version of InovWine by one of the major Portuguese wine producers offers the chance to observe the impact of the actors' characteristics (e.g., their influence in the wine sector, financial means, and technological background) in the business model success.

The increasing importance assigned to the co-creation of value propositions and service innovation makes it reasonable to expect that the practical potential of BIZ2BIS will be recognized. For example, we presented it to an African company responsible for the ATM transactions in its country. Its managers intend to reduce the maintenance cost of their information system and introduce innovative services through the implementation of a new, networked, business model supported by collaborations with European and African companies. Documentation on BIZ2BIS was provided and a meeting has already been scheduled. Furthermore, the application of the approach to other scenarios can aid to develop patterns to address a particular business model aspect (e.g., the development of services relevant to critical actors or conflicting negotiations).

Second, it would be interesting to compare the outcomes obtained with our interpretation and use of ANT with those achieved by other theoretical influences. In our opinion, the comparison can be specially challenging if these influences stem from a different paradigm. Under these restrictions, diffusion theory captured our attention. In this theory, the social system and technology are regarded as separate, and the latter is transferred and adopted in its original form (or reinvented in its implementation) (Nijland, 2004). Typical applications of this theory focus on finding adoption-diffusion factors for already black-boxed innovations. On such a different perspective, Latour claims that "after many recruitments, displacements and transformations, the project, having become real, then manifests, perhaps, the characteristics of perfection, profitability, beauty, and efficiency that the diffusion model located in the starting point" (Latour, 1996a). In spite of the apparent incompatibilities with ANT, we believe diffusion theory can aid in the identification of factors that can sharpen our business model understanding and for that reason should be carefully addressed.

Third, the implementation of an application to support the use of BIZ2BIS in the field would be helpful. The solution should allow the introduction of data by several users, while attending meetings or performing interviews, according to the fields presented in the "Networked business model chart" and "Actor description chart". The information they gather supports the development of other instruments. Therefore, the obtained data can be used as a starting point to automatically create their draft versions. Furthermore, the knowledge acquired through BIZ2BIS can be used in combination with other domains. For instance, fields such as business intelligence and simulation can provide the necessary background to boost the capacity of the approach to predict and simulate future scenarios, enhancing its ability to address the network dynamics.

Fourth, the development of synergies between BIZ2BIS and the Business Model Canvas would increase their applicability and streamline their outcomes. During our research, we were invited to provide some assistance in the analyses and design of two networked business models not addressed in this thesis. In these two scenarios, artifacts from our proposal were used to perceive the network's interactions, the interchanged flows, the negotiations carried out, the achieved alignment, and indications about the supporting information systems of the business models. Simultaneously, the Business Model Canvas was also employed to cover the "private" business model of a common actor to both business models. Through the developed work, it was possible to witness the interesting bridges that were established between these different views. On the one hand, the data gathered through our approach when studying the networked business models was used to define (or redefine) the "private" business models of the actors that compose the network. On the other hand, when discussing issues from the "private" business models of each actor, Business Model Canvas provided useful insights for the network. This situation is not a surprise, since Osterwalder's work was used as one of the sources of inspiration to develop BIZ2BIS (e.g., components to address, or the use of the business model as a communication tool), which promotes points of contact.

Fifth, due to the characteristics of the studied cases we were never able to fully explore the insights that SNA could bring to our approach. Nevertheless, in situations where the number of actors is higher and there is access to data on the exchanged flows, it will be interesting to consider SNA (e.g., the centrality concept) and combine its outcome with the ones provided by BIZ2BIS. This can be particularly relevant in situations in which, for some reason, will not be possible to capture the actors' perceptions on the business model.

Sixth, the nature of ANT and action research makes them outstandingly suitable for a critical information systems research project (for instance, in the public sector). The specific purpose of this type of project ranges from creating knowledge as a catalyst for change, to aiding and giving voice to various marginalized groups and stakeholders in information systems development (Cecez-Kecmanovic, 2007). In light of the economic turmoil at the beginning of the second decade of the present century, the use of humanistic principles in information systems, see for instance (Mumford and Sackman, 1974), lost relevance. The mainstream information systems research adopted the purpose of assisting managers in achieving business success through the attainment of knowledge that informs and sustains their decisions and activities. To question this state of affairs, critical information system researchers propose an alternative vision. They believe in the power of knowledge to transform consciousness and are convinced that one of their obligations is to contribute to more democratic and balanced organizations (Klein and Myers, 1999, Myers and Klein, 2011). We trust that BIZ2BIS can contribute with its insights to a more equitable society through the development of sustainable business models in which all the actors' interests are respected (or at least considered as much as possible) and inscribed in the information systems. Researchers can also have their own expectations (viable or not).

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APPENDIX A

Appendix A

Meetings/interviews held during the InovWine project

We recap the meetings/interview held during the project. For each one we present its date, the actors that attended it, and their goals.

Meetings/Interviews timetable

26th of May, 2010	Meeting between IPN, Biocant, Adega Cooperativa de Cantanhede, and Producer. The actors that attended the meeting were: António Cunha, André Pardal, Carlos Bento, Paulo Rupino, Cristina Chuva, Ana Catarina Gomes, Maria Gama, Sara Sousa, Catia Pinto, José Torres, Maria Miguel Manão, Leonor Novais, e José Matos. The meeting took place in Biocant **Goals**: • Outline of the InovWine project • Present the actors involved in the project • Describe vineyard problems and activities • Identify common diseases in the vineyards • Explain the importance of identifying new yeasts
8th of June, 2010	Meeting with Biocant. The actors that attended the meeting were: Paulo Rupino, Cristina Chuva, and Ana Catarina Gomes. It was held by videoconference **Goals**: • Discuss Biocant's know-how about producers, ACC, and nurseries • Identify Biocant's long-term interests in the project

Meetings/Interviews timetable

17th of June, 2010	Meeting with LAS. The actors that attended the meeting were: António Cunha, André Pardal, Paulo Rupino, and Cristina Chuva. The meeting took place in IPN. **Goals**: • Identify the wireless sensor network requirements to discuss with the remaining actors of the project • Understand the cost involved in deploying wireless sensor network and RFIDs • Identify the relevant abiotic data for the project • Perceive the long-term interest for LAS
2nd of July, 2010	Meeting with ACC and producers. The actors that attended the meeting were: André Pardal, Cristina Chuva, José Torres, Vitor Damião, Maria Miguel Manão, Leonor Novais, Ricardo Botelheiro, and Rosa Silva. The meeting took place in ACC **Goals**: • Understand the cooperative strategy in order to take advantage of the project • Perceive how the grapes are treated in the cooperative: reception process, grapes payment, wine production • Identify topics that characterize a quality wine • Spot conditions that can lead to the wine quality improvement • Indentify the most important abiotic data for the vineyard treatment • Perceive how the electronic devices must be arranged in the vineyards • Identify the information provided by the cooperative to the producers to assist in the vineyard treatment • Analyse the current grapevine certification process and its limitations
13th of September, 2010	Meeting with Viveiro Vitivinícola Pierre Boyer. The actors that attended the meeting were: André Pardal, Cristina Chuva, e Cláudia Miguel. The meeting took place in IPN **Goals**: • Clarify the activities carried out by the nurserymen • Understand the grapevines certification process • Identify possible problems on the insertion of RFIDs in the grapevines • Set the proper timetable to implant the RFIDs in the grapevines and identify the best way to introduce them (several test must be performed to assure the plant, and the material, safety)
24th of September, 2010	Meeting with ACC. João Vitorino, Paulo Rupino, Cristina Chuva attended the meeting that took place in ACC **Goals**: • Perceive how the grapes are delivered at ACC • Observe the various stages of ACC wine production • Understand how the value to pay for the grapes is assigned • Comprehend how the DOC designation is assigned to the cooperative wines

Meetings/Interviews timetable

7th of October, 2010	Meeting with Biocant, attended by Ana Catarina Gomes, André Pardal, and Cristina Chuva. It took place in DEI. **Goal:** • Understand how Biocant will be able to complement the current grapevine certification process
7th of October, 2010	Follow-up meeting in DEI, attended by Carlos Bento, Paulo Rupino, Francisco Pereira, António Cunha, André Pardal, Cristina Chuva, Gilberto Neto e Alexandre Lopes, Ana Catarina Gomes, Maria Gama, Sara Sousa, and Catia Pinto. It took place in DEI. **Goals**: • Present the project status • Analyze the outlined business model feasibility • Introduce LIS new team members
5th of November, 2010	Meeting in IPN with André Ribeirinho (Addega.com). Attended the meeting from IPN António Cunha, André Pardal, Paulo Rupino, Cristina Chuva e Joana Santos **Goals**: • Present the project • Assess the InovWine acceptance • Obtain tips for using the InovWine features in other scenarios • Gather contacts from the wine industry
5th of November, 2010	Meeting in IPN with José Eduardo Silva (Cortes de Cima). Attended the meeting from IPN António Cunha, André Pardal, Paulo Rupino, Cristina Chuva e Joana Santos **Goals**: • Present the project • Assess the InovWine acceptance • Obtain tips for using the InovWine features in other scenarios • Understand the interest that large producers may have in a project like InovWine
25th of November, 2010	Meeting with Biocant and Viticert, attended by Ana Catarina Gomes, Maria Gama, Sara Sousa, Catia Pinto, Cristina Chuva, André Pardal, and Ricardo Andrade. The meeting was held in Biocant **Goals**: • Present the InovWine project to Viticert • Understand in detail the grapevine certification process • Identify situations where the use of RFIDs can be beneficial to the certification process

Meetings/Interviews timetable

15th of December, 2010	Meeting with Biocant and Viticert, attended by Ana Catarina Gomes, Maria Gama, Cristina Chuva, André Pardal, Ricardo Andrade, e Cláudia Miguel. The meeting was held in Viticert head-office **Goals**: • Identify different ways to insert RFIDs in the grapevines • Set the date to perform the tests
15th of December, 2010	Meeting with Biocant Viticert, and Estação Vitivinícola Nacional, attended by Ana Catarina Gomes, Maria Gama, Cristina Chuva, André Pardal, Ricardo Andrade, and Eiras-Dias. It took place in Estação Vitivinícola Nacional **Goals**: • Present the InovWine project to Estação Vitivinícola Nacional • Assess the Estação Vitivinícola Nacional interest in taking part in a project like InovWine
21st of December, 2010	Follow-up meeting in DEI, attended by António Cunha, André Pardal, João Lucas, Carlos Bento, Paulo Rupino, Cristina Chuva, Ana Catarina Gomes, Maria Gama, Sara Sousa, Catia Pinto, Maria Miguel Manão, Leonor Novais, Ricardo Botelheiro, Vitor Damião, e José Matos. The meeting was held in Biocant. **Goals**: • Present the project status • Discuss the results expected for the year 2011 • Schedule future activities • Schedule the next meetings
10th of January, 2011	Meeting in IPN, attended by Carlos Bento, Paulo Rupino, and Cristina Chuva **Goals**: • Clarify the rights of access to data after the project is over • Perceive the project intellectual property rights
19th of January, 2011	Meeting with Biocant, IPN, and Estação Vitivinícola Nacional. It was attended by Ana Catarina Gomes, Eiras-Dias, Margarida Santos, José Silvestre, Clímaco Pereira, Eugénia, Cristina Chuva, André Pardal, and Hugo Neto. It was held in Biocant. **Goals**: • Obtain access to the national collection of grapevines • Access to data from the meteorological station of Dois Portos • Discuss biotic and abiotic data that could be relevant to the InovWine project • Perceive how Estação Vitivinícola Nacional could contribute to the InovWine project

Meetings/Interviews timetable

25th of January, 2011	Meeting in the vineyard where the pilot study is being developed. It was attended by Arsénio Cavaco, Leonor Novais, José Matos, Cristina Chuva, Alexandre Lopes, and Marta Martins **Goals**: • Present a prototype of the developed application (via the mobile device) to the producer and to ACC
31st of January, 2011	Meeting between LIS and LAS. It was attended by Carlos Bento, Paulo Rupino, Cristina Chuva, Hugo Neto, and António Cunha **Goals**: • Prepare for the next meetings with Biocant, ACC, and Estação Vitivinícola Nacional • Decide the feasibility of the application requested by Viticert
8th of February, 2011	Meeting with António Graça (Sogrape). It was attended by Cristina Chuva, Ana Catarina Gomes, Hugo Neto, António Cunha, André Pardal e António Graça and it took place in Sogrape. **Goals**: • Identify future collaborations with Sogrape • Obtain feedback about the project • Verify the chances to access Sogrape meteorological data
22nd of February, 2011	Follow-up meeting in IPN. It was attended by António Cunha, André Pardal, João Lucas, Hugo Neto, Paulo Rupino, Patrícia Luíz, Cristina Chuva, Alexandre Lopes, Ana Catarina Gomes, Maria Miguel Manão, Leonor Novais, and Rosa Silva **Goals:** • Present the project status (selects sensors and RFIDs, as well as the technological architecture of the system to develop) • Define the two workshops scope and the dates on which they will be conducted • Take into account possible project partnerships, namely with Estação Vitivinícola Nacional and the Meteorological Station of Bairrada
24th of March, 2011	Meeting with the Meteorological Station of Bairrada, attended by José Santos, André Pardal, Cristina Costa, Ana Gomes, Rosa Silva, Maria Novais, Maria Magalhães, and Maria Marques. It was held in the Meteorological Station of Bairrada **Goals:** • Present the InovWine project to the Meteorological Station of Bairrada • Perceive if it was possible to establish future collaborations • Check the relevance of the Meteorological Station of Bairrada's meteorological data for the InovWine project

Meetings/Interviews timetable

20th of April, 2011	Meeting with the development team in IPN. It was attended by Cristina Chuva, Paulo Rupino, Carlos Lopes, Alexandre Lopes, and Bruno Almeida **Goals:** • Clarify any doubts that the development team had with business model document analysis • Perceive if the document was able to respond to the needs of the development team • Receive feedback about the document
28th of April, 2011	Meeting with Carlos Bento, Paulo Rupino, António Cunha, André Pardal, and Cristina Chuva. It took place in IPN **Goals:** • Obtain meteorological data • Establish procedures to install equipment in the vineyards and collect data • Define how the data will be transmitted to the database by the wireless network
30th of June, 2011	Follow-up meeting in Biocant. It was attended by André Pardal, João Lucas, Cristina Chuva, Carlos Lopes, Bruno Almeida, Ana Catarina Gomes, Maria Miguel Manão, Leonor Novais, and Rosa Silva **Goals:** • Present the project status • Organize the workshops • Schedule meetings to discuss the inquiry
4th of July, 2011	Meeting in the vineyard where the pilot study is being developed. It was attended by Leonor Novais, José Matos, Cristina Chuva, Alexandre Lopes, Carlos Lopes, and Marta Martins **Goals**: • Present a prototype of the developed application (via the mobile device) to the producer and to ACC • Discuss the inquiry to validate the viability of the business model
6th of July, 2011	Meeting in Biocant, with Ana Catarina Gomes **Goals**: • Discuss the inquiry to validate the viability of the business model
21st of July, 2011	Meeting in ACC, with Maria Miguel Manão **Goals**: • Discuss the inquiry to validate the viability of the business model