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## Knowledge Management Systems and Performance Analysis in Electronic Business Models

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*The convergence of several fundamental strands has resulted in the digital economy as an economy of knowledge which is in character, brawny virtual, molecular, network-based, convergent, innovative, participative and global. It tends towards gradually eliminating intermediaries in trade. The traditional value chain, whose scope of application is essentially industrial, has ceased to be meaningful, and has been replaced by business models structured around powerful "networks". Today, traditional rules have been replaced, increasing innovation has cut both the costs and time needed to produce and distribute a product and/or service, and innovations are imitated by rivals almost instantaneously. Some examples of electronic business models in the digital economy are models of an aggregating and integrating nature based on alliances, or simply open market-type models. Strategy maps help companies to better understand their*

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*knowledge management processes in order to create value and achieve a sustainable competitive advantage. The new dimension and typology of business, the failure of traditional indicators with the trend in the financial markets, and the re-organization of corporate structures require specialized tools. Every business model is an expression of a new dimensional logic, where information sharing, the use of communal structures, the speed of technological developments, the heightened use of resources, and its modular nature, demand for different strategies. This paper focuses on the balanced scorecard tool as an effective tool in achieving a sustainable value standard.*

### Introduction

Innovation Cycle (IC) or Innovation Value Chain (IVC) claims for a deep analysis on knowledge identification, measurement and reporting. Radical changes have occurred in the last two decades of the 20<sup>th</sup> century. New business models have also emerged in which knowledge creation, capture, re(use) and diffusion establish the way ahead to value creation. Companies need to identify their drivers that contribute for a higher value level and intensity. Investment in knowledge management systems is probably the first step towards innovation philosophy and, consequently, for sustainable wealth creation.

Intangible assets appear, nowadays, as an important issue in the accounting rules frontier—the intrinsic difficulty in their measurement causes an information perception gap between companies' financial reports and stakeholders' analysis and understanding. In fact, they have an internal value but due to their volatile nature and difficulties in their measurement, they are normally excluded from financial statements and are not included in the knowledge management systems. However, according to their linkage and contribution for certain businesses, their importance for stakeholders is irrefutable. Traditional financial reports, based on historical accounting rules, that exclude the potential return, seem to be irrelevant for decision-making. Thus, intangible assets identification and measurement approaches can increasingly contribute for better decision-making and support.

In this paper, some knowledge management issues are addressed, in particular the drivers that potentially influence companies' value creation. The balanced scorecard appears as an important tool that interlinks the corporate strategy within a set of performance metrics. This cause-and-effect scheme underlines the importance of knowledge management and the emergence of this measurement in a systematic and dynamic basis. Effectively, knowledge strategy should drive the technology choice and characteristics. Some concepts have emerged in the knowledge management systems, technologies that, over the years, have changed notions like time and space. New business models have also emerged, strongly supported by multiple platforms that have increased the companies' innovation cycles and innovative value chains.

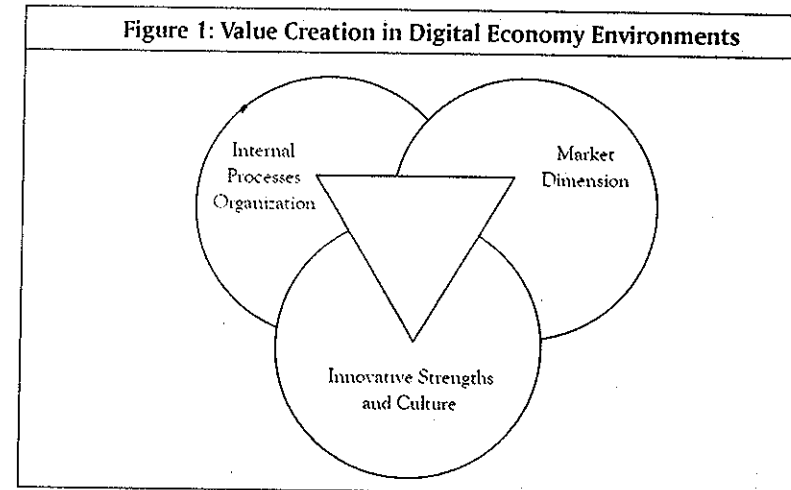
The balanced scorecard and other complementary tools represent a way by excellence in strategy identification and performance measurement. New business models, based on particular strategies; show specific cause-and-effect relations and require differentiated performance measures. For this specific context, this paper tries to identify a theoretical perspective on the use of the balanced scorecard in the electronic business environments.

### Balanced Scorecard as an Integrated Knowledge Management System?

Traditionally, performance analysis was supported by financial measures through accounting-based indicators as net operating profits, return on investments, and return on assets, among others. Accounting rules are not aligned with the value creation approach—required by companies in modern economies and specifically in certain types of electronic business models—specially those that have been born from the digital economy. It has stressed the emergence of new performance indicators as economic value added, cash flow return on investments, and cash value added. Broadly, new business models—in which intangible assets act as key success factors—emerging in a digital context, have put out additional issues concerning companies' performance analysis. New indicators are required that can measure, on a feasible basis, the value creation inside those companies and their retention capacity.

Value results from the convergence between strategic dimensions as stated in Figure 1—internal processes, market and innovative strengths and culture. It is based on knowledge capture, transformation and use. Companies that can use that

Figure 1: Value Creation in Digital Economy Environments



knowledge on a systematic and sustainable basis can expect more returns in a long-term. Knowledge helps companies to achieve sustainable competitive advantage. However, internal processes innovation, a fair and true market approach throughout a value creation culture can help organizations in their own integrated development scheme.

Hence, creation of insights, skills and relationship is probably the key objective in any knowledge acquisition process. The culture should be built on knowledge acquisition, sharing and use processes which drive the technology choices inside the companies. A set of metrics (financial and non-financial) is required that measure the value creation resulting from those activities.

Balanced scorecard, opine Kaplan and Norton (1996, p. 21) "retains financial measurement as a critical summary of managerial and business performance, but highlights a more general and integrated set of measurements that link current customer, internal process, employee and system performance to long-term financial success". Therefore, this tool is viewed as a measurement, communication and strategic management system using complex cause-and-effect chain relations (Niva 2002). It was traditionally developed through four perspectives—financial, customer, internal, learning and growth—and, according to available literature, should yield a mix of outcome measures and performance drivers, strongly align-

with business strategy. Broadly, as stated by Kaplan and Norton (1996), the scorecard creates a holistic model of the strategy that allows individuals and groups to see and understand how they can contribute to organizational developments. It allows companies to align strategies, identify targets and evaluate on an ongoing basis the “state-of-the-art” about any particular dimension.

### Development of Knowledge Management Systems

Knowledge Management Systems (KMSs) are defined as systems that can capture, create, store, organize and disseminate organizational knowledge in a systematized way (Nonaka and Takeuchi, 1995; Offsey, 1997; Alavi and Leidner, 1999). It seems that speed and quality in the capture, creation, codification and sharing process is powerfully linked with the implementation of technological platforms that can support integrated management approaches.

A functional knowledge management system is held in four essential discrete repositories—people, processes, systems, and culture—and demands that this knowledge is acquired, created, shared, managed and released through a judicious combination of these four fundamental sources. It also requires that the architecture of this knowledge (data, information and knowledge) is clearly understood in the organization (Elliot, 1997; Serrano, 2003).

Currently, technological platforms can support systems for knowledge management, potentially using modern information technologies, and representing in that way one of the main driving forces behind this capture, production and dissemination of knowledge.

Traditional systems, orientated in a first step to the development at management-level planning, control and decision objectives (Marchand *et al.*, 2001), which had a direct impact essentially on internal structures, suffered from a plethora of irrelevant information. The increasing importance and complexity of information and communication systems and technologies in recent decades has triggered the emergence of new approaches that can lead to the definition of new architectures founded on sustained reflection of information systems role and technologies.

Over the years, development of information systems has allowed to supply information at any level of the organization. However, the level of centralization and

the type of information supplied have kept up with the technological development of these systems. In this sense, KMSs represent a new line of systems aimed at providing non-structured information, in which knowledge becomes accessible to the right people in the right place at the right time (Offsey, 1997; Chait, 1999). The revolution in the concepts of time and space seem to direct the new business logic, emerging from the new economy. This revolution can be expressed through the possibility of integrating information via a number of technological platforms (mobile devices, personal computers and large monitors), using modern IT devices (Offsey, 1997). Once the user becomes a supplier of information content, its focus is on tacit knowledge (Nonaka and Takeuchi, 1995) and their future and dynamic conversion into explicit knowledge. Within the perspective of individual knowledge, those systems, as a limited organizational resource, are used as a means of communication that connects people and promotes mutual interaction.

In recent years, some differentiated technologies have been supporting knowledge management in organizations: internet, intranets, document management systems, information retrieval engines, relational databases and object-oriented databases, electronic publishing systems, workflow systems, push agents and technologies, help-desk applications, brainstorming applications, data warehousing systems and data-mining systems. Many technological platforms used and real-time information monitoring with large monitors, are indicators of flexible and distributed systems, which are fundamental characteristics of current information systems.

### The New Business Models: Basic Typologies

Recent literature on the digital economy has demanded the construction of new business models that differ from traditional models in form and content. The still bitter scepticism regarding any new model that creates wealth for shareholders is justified by financial arguments and, above all, by the investors' behavioral concerns. The large investments in 'digital economy companies' sometimes find no support either in the high rates of return predicted or in significant alterations in investor behavior. We do not believe that all the changes seen in the characteristics of business have changed the levels of prudence among investors. We sometimes wonder whether we are confronted with a change in trading models and not in business models. Electronic business models typology proposed by Tapscott *et al.* (2000), is designed according two fundamental vectors: its control level and its integration level.

The new trading models have not destroyed traditional approaches. A new dimension has just been added: the creation of value results from the interaction between buyers and sellers in a new market context. The difference lies in the volatility of external business influences, including new technologies, customer expectations, deregulation, globalization, industrial structure and financial markets. The outcome of this severe volatility can be seen as new opportunities in which Internet not only functions as a vehicle for the transmission of value *par excellence* but also develops the relationship with customers by means of instantaneous action and, also, bilateral communication. The focus on buyers and sellers in a non-traditional context allows us to identify four e-business models—Balanced, Diversified, Bold and Ambitious—this approach follows the thinking proposed by Tapscott *et al.*, and will be dealt with in due course.

Those approaches were based on two complementary orientation vectors—their focus on the seller or their focus on the buyer.

The direct type of electronic business model is characterized by its transactional nature. It is presented as the simplest model in terms of transactions in that the exchange of goods and services between buyers and sellers is direct, irrespective of its size. The flow of information and assets is, therefore, controlled by both participants in the system.

Equally transactional in nature, the market specialist model brings together a number of sellers seeking to satisfy the needs of a number of buyers via a specialist forum. These may take the form of auctions, electronic catalogues, exchanges or simply open markets where the trading focus gives place to content integration through the combination of different value chains.

Both the portal model and the buyer/seller cooperation model are integrated. The portal model not only serves as a gateway to countless locations but also offers access to a varied portfolio of products and services. Considering some of the most successful models in the digital economy (e.g., Yahoo!), it provides its manager with profits from advertising and from the share it may have in the sale of such products and services. For the seller, access to potential buyers seems to be an advantage that explains the success of such a model.

The buyer/seller cooperation model depends on cooperation at the level of the different internet-based activities in the value chain. Its goal is, essentially, to boost efficiency, shorten the production cycle and allow the development of products and services.

Using the original terminology (*b-webs*), it is time to explore their fundamental features and determine their intrinsic potential. The Agora model, which is similar in form to the market specialist model presented above, is characterized by the absence of intermediaries, e.g., holders of products for resale. The context provider simply facilitates the negotiations and deals between buyers and sellers (content providers) instilling trust and authenticity in its users. Its added value is derived from the creation, management and regulation of mechanisms that allow prices to be set, products and services to be supplied and knowledge and other intangible benefits to be transferred. One of the examples illustrating this model is eBay.com. The earlier model, which identified as the one that allows greater liquidity, may take the following forms: an open market, supply-side auctions, demand-side auctions and exchanges. In this model the price may be negotiated, physical space is no longer required, and the market has become global and highly malleable.

The Ariba Network and Amazon.com are typical examples of aggregator-type e-business models, in which products are linked directly to the final consumer via content providers. These are intermediaries in the deals between both parties, creating value for all those who are directly or indirectly involved—producers, consumers and shareholders. To respond to an opportunity, essential variables are, therefore, the selection, organization, price, convenience, conformity and integration of services. In the form of “the super-aggregated”, electronic sources of information, e-brokerage consumer portals or industrial centres, the crucial transformation lies in the maximization of efficiency as a result of the level of integration that this allows.

The value transmitted to customers in the aggregator model does not come exclusively from the intermediaries in the transactions. The customers, too, are involved in its creation in generating important information whenever they make a purchase. Irrecoverable information in a traditional system (e.g., expectations that have not been met) can now be processed and shared in the value system.

In digital economy, traditional value chains are replaced by demand-driven value chains. The answer is given to the customer directly; the main functions are now centered on the processes of content production and management and on knowledge flows and other intangibles. The aim is to provide the customer with an integrated service and/or product that meets his or her specific needs. In this model, the context provider defines the aims, coordinates each participant's contribution, controls the product characteristics and manages the different stages of implementation. Innovation value chains are now responsible for determining quality, market response times and the levels of return on capital invested.

The case of Cisco Systems illustrates the above points. Included in a cooperation model of an essentially integrating nature, its principal focus is on the fact that it provides an appropriate but integrated solution.

Another business model of no less importance than those above is, without doubt, the alliance type. By means of modular contributions, each participant—suitably aligned with others—extracts value from the aims defined and attained on a shared basis. The networks operate as basic elements in boosting the profits for all participants. This type of model can bring together the most diverse kinds of participants. The open sharing of information and power, the alignment of all participants, the transparency of the participation rules and the recognition of the value obtained are just some of the factors that make these models a success.

Distribution networks represent the infrastructure of the whole economy. Their function and value do not require extensive explanations: they facilitate the transmission of information, products and/or services. For this reason, they are the “spinal column” of digital age business.

Another type of model can be found in the literature (Schwartz, 1999). However, the same reality is catalogued differently. It reveals that digital economy companies reinvent their models and formulate their strategies to respond to ever more explosive opportunities. Hamel (2000, p. 66) states, “Innovation in the concept of business is the key to the creation of new wealth”. In the digital economy, the unit of analysis for innovation is not the product or technology but, rather, the concept of business itself. The objective of focussing innovation on the concept of business is to introduce more strategic variety into a certain strategic sector or field. In general, whenever this

variety is valued by the customer, the distribution of the potential for wealth creation moves radically in favor of the innovator.

The same logic of innovation is used when the problem of value migration is addressed which is at the origin of the new business concept proposed by Hamel (2000). This involves four main components (essential strategy, strategic resources, the customer interface and the value network) and rests on four fundamental pillars (efficiency, exclusivity, compatibility and profit drivers). Given the importance and relevance of the ‘value network’ component, the analysis is centred on that.

The four main components of this business model are interconnected by means of three distinct intermediary aspects: the configuration of activities, which reflects the interconnection between strategy and the indispensable resources for its implementation; the benefits to the customer in the form of the value created by the company's strategy (transferred to the customer); and the company's frontiers, which represent the links between it and the sources of its resources.

Value network, the fourth component in this business model, complements and enhances the company's own resources since, in the digital economy, many of these resources lie outside its direct control. Thus, the elements of the value network are the suppliers, the partners (suppliers of complements that are critical to a final product or solution) and the alliances (competitors who think in a similar fashion) which the company establishes as a way of maximizing this value. It can, therefore, be stated that the “design” and careful management of the value network are the main source of innovation for this business concept.

Finally, it remains to be mentioned that any business model must observe four fundamental factors if it is to have the potential to create wealth: a) it must be an efficient means of offering benefits to customers; b) it must be exclusive in the sense of being unique in conception and execution; c) it must have a degree of compatibility among other elements or must be internally consistent; and d) it must possess profit drivers that have the potential to generate above-average returns.

Thus, the value network represents the core and the source of competitive advantage in the digital age.

### Generic Strategies in Electronic Business Models

Capitalization of companies in a dynamic market not only depends on their assets and capabilities but also on the nature and characteristics of the strategies they formulate and implement. Dependent on the structure of the industry, the products and services complexity presented to the market, the impact of new technologies, the financial markets reactions, legal/fiscal environment and customers, and the revitalization of their capabilities, have become a "golden rule" for success in this business.

Concentration strategies are reflected in a range of specialized services or products for an equally specialized market or market niche. With their operational excellence and a high level of complexity, the products on offer provide these companies with margins considered comfortable.

Time saved is one of the advantages of combined strategies since it allows a higher number of transactions and an increase in internet traffic. *Amazon.com* is an example of this strategy, as it has been expanding its product range.

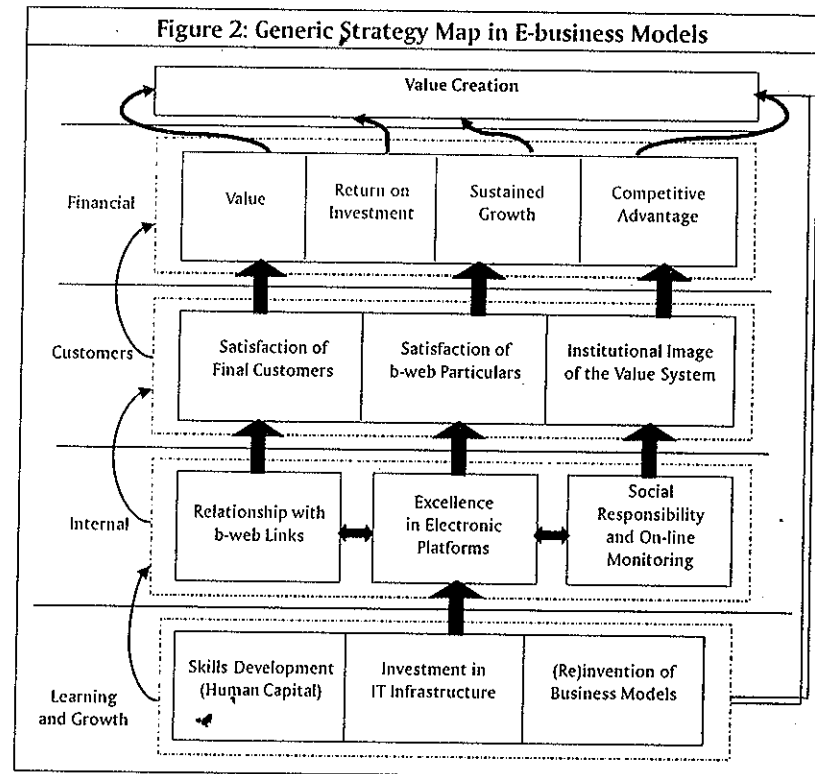
Control strategies, which are integrated and place a heavy emphasis on the relational aspect, represent the consolidation of knowledge by participants in a certain industry or function. Their central objective is to assume a leading position that can serve as a source of information, a benchmark for good practice and a privileged channel for new products and services. Finally, coordination strategies are centred on the creation and management of internet-based companies. With the relational level that these possess, they can create a strong presence within a particular industry or even over various industries.

When interconnected with a certain business model, these strategies allow companies to exploit or create capabilities, and even re-invent themselves around themselves (innovation cycles and innovation value chains). New business models can emerge, capable of responding to an ever more fertile range of hidden opportunities.

### Balanced Scorecard Tool in E-business Models

As previously mentioned, the balanced scorecard tool was developed around four basic perspectives—financial, customer, internal, learning and growth—and based

on a cause-effect relations chain. Figure 2 shows a generic strategic map applicable to businesses that are developed through electronic platforms.



Financial perspectives should be measured in their four dimensions: value added, return on investment, sustained growth, and competitive advantage. These long-term outcome objectives are based both on a traditional financial approach as investments returns and in a value-added approach. Profitability and revenue enhancements can support a long-term sustained growth and the achievement or maintenance of competitive advantages.

Interlinked in a cause-and-effect relation, customer perspective is conducted by three important dimensions: customer satisfaction, business webs participants' satisfaction as content providers, and institutional image of the entire value system.

Quality, time, and price are the variables that contribute to satisfaction indexes (Kaplan and Norton, 1996, p. 84). Companies should be aware of these variables impact on entire perspective performance. In an electronic business, another key variable should be added—safety measures. It will contribute to image and reputation improvements and customer retention.

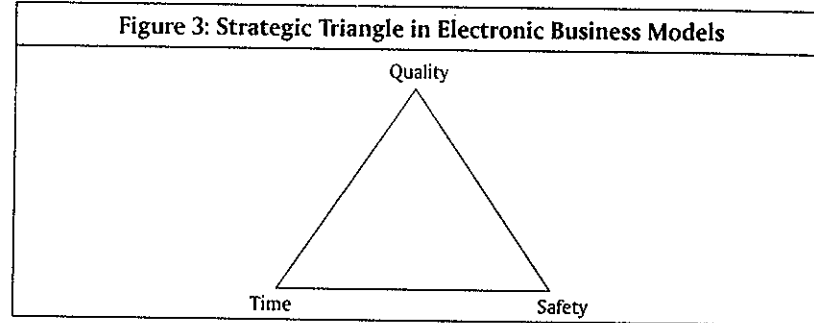
Internal processes perspective is strongly related to innovation intensity and innovative culture as already stated in this reflection. Relationship with business web links, excellence in electronic platforms, social responsibility and on-line monitor system are the key dimensions that should be measured and reported. This perspective is no longer based only on cost, quality and time—in this context, but—grant data safety is probably the most critical process. Innovation cycle should be reinforced and information and communication technologies capabilities should be monitored. Aligned with customer perspective, safety guaranty message should be automatically passed to stakeholders, in particular to customers.

Finally, learning and growth is also seen, in this domain, as the basis for competitive advantage achievements. Investments in human capital and in information technologies infrastructures will certainly contribute to employee's satisfaction, productivity and retention rates. However, electronic business models require a permanent reinvention process (human and technological capabilities).

As mentioned above, in electronic structures, a new proposal for value emerges: the internet becomes a primary structure. Value is created and managed, sometimes, through complex innovation chains. These models, with their intrinsic forces, apply and require multiple participants: competitive advantages in terms of costs, capacities, innovation, competence, and future returns are dependent on the core capabilities of the various companies (providers) which integrate the business system.

The performance of these business models is not exactly linear. Its complexity results from the multiplicity of agents (contributing to global value of the system) that, on the basis of a synergistic interdependence, should provide and guarantee a solid and dynamic competitive advantage. This interlinked style of doing business requires a new breed of pioneers, brawny supported by information and communication technologies, to drive the companies. New cost categories arise such as those for search, contracting and coordination.

Several metrics can be used to measure the electronic-based business models. Quality, time and safety (Figure 3) become the key issues that drive these companies to increase their value creation. Information systems safety controls act as a key driver in the internal processes perspective.



Aligned with those three dimensions, some specific measures in electronic business models are shown in Table 1. This is not an exhaustive list of performance indicators. Each electronic business model should be measured according to their specificities. Further investigation for each case study is required in order to identify the most adherent indicators that can measure on a feasible basis the perspectives under analysis.

**Table 1: Examples of Specific Measures in Electronic Business Models**

Financial	Customer	Internal	Learning and Growth
Economic Value Added (\$)	Customer satisfaction (Index)	# Platform access failures	# ICT specialists
Return on investments	Intermediate participants satisfaction (Index)	Response time (hours)	Investment in IT infrastructure (\$)
EBITDA (\$)	# Repeated buyers	# Non-conformities identified  # Transactions not completed	Technological communication infrastructure speed (Bps) # New projects
Market Share Growth (%)	# Transactions interrupted (%)	# Average ordering time (minutes) # Host time outstanding (hours)	Research and development investment level (\$) Revenue per employee (\$)

Note: # Needs further evaluation/investigation.



Performance measure became, in late 1990s, a key concern inside organizations (private, public or non-profit organizations) and within organizations (entire value system with several agents and providers). Value systems became also more complex than ever and more accurate information is demanded by stakeholders. Non-financial metrics and their cause-and-effect relation with financial measures should be identified. Electronic business models contradict the conventional logic once they follow continuously the innovation logic.

Conventional logic treats opportunities according with its actual resources and capacities whereas innovation logic would never admit any kind of constraint caused by that level or resources and/or capabilities. Supply products and/or services do not obey to this logic, the traditional limits rule imposed by the industry—it focuses the overall solution and, thus, on the generic value chain, even if that leads the organization to the brink of a new business. In this approach and in the ambit of business, the search for synergy ceases to limit itself to the main activities and the support activities of the value chain to assume the most diverse shapes: knowledge sharing, strategy coordination, physical resources sharing, vertical integration, negotiation sharing and the creation of combined businesses.

### Conclusion

The new view of the value chain, which takes on a long-term financial outlook, requires a structure that can create new products and/or services which match the emerging future needs of potential differentiated customers and markets. The innovation process has become, for a large number of organizations, a more important parsimonious of a future financial performance that can be in itself, their operational cycle. This means that, in the emerging markets, already catalogued as new business models, the success states on the organization's capacity to on sustainable way, manage the development process and reaching new categories of costumers with a high retention power.

The key factors of competitiveness which have directed the evaluation of industry attractiveness in the last decades continue to constitute an essential basis for that evaluation, although due to the differences of performance deriving from the followed strategies, they have been complemented with the analysis of the competition position.

Markets development, strongly forced by technology development, even by the evolution of quality concepts and by the business ethics in itself, has been demanding the development of new techniques which enable us to measure the business-related performance but also the business own risk.

The balanced scorecard can be used as an integrated tool either in electronic business models. Cause-and-effects relations can be identified within several perspectives (probably additional perspectives should be integrated in that tool) and their dimensions measured throughout specific value-added performance indicators. Further investigation should support the assertions presented in this paper.

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