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## **RESUMO/ABSTRACT**

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This article is both a review and an agenda-setting piece. It argues that knowledge management suffers from conceptual and definitional ambiguity, oversimplification of its development processes, and methodological limitations. Nevertheless, there is a consensus in business and academia that knowledge is a key component of success and allows firms to achieve and sustains competitive advantages. In a digital era, these advantages arise from the potential of data and information that can be gathered, processed, shared, and used to improve e-business activities. Thus, this research bridges the gap in the assessment of knowledge management and e-business relationship, by applying an SEM to a large database sample of KM activities performed by European firms.

**Keywords:** Knowledge management, e-business activities, European and US firms, information and communication technology

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## **KNOWLEDGE MANAGEMENT: CRITICAL PERSPECTIVES ON E-BUSINESS ACTIVITIES**

### **Abstract**

This article is both a review and an agenda-setting piece. It argues that knowledge management suffers from conceptual and definitional ambiguity, oversimplification of its development processes, and methodological limitations. Nevertheless, there is a consensus in business and academia that knowledge is a key component of success and allows firms to achieve and sustains competitive advantages. In a digital era, these advantages arise from the potential of data and information that can be gathered, processed, shared, and used to improve e-business activities. Thus, this research bridges the gap in the assessment of knowledge management and e-business relationship, by applying an SEM to a large database sample of KM activities performed by European firms.

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## **Introduction**

In today's highly competitive business environment, companies need to use their skills to obtain the greatest competitive advantage (Spender, 1996). In creating and maintaining competitive advantages, organizations are developing efficient processes for managing knowledge (Liao, Fei, & Liu, 2008). In a period designated by some as "digital age" and by others as "knowledge age," the emphasis placed on business arises in the use of technology to maximize the application of knowledge (Soto-Acosta & Meroño-Cerdan, 2009; Zheng, Yang, & McLean, 2009).

In virtual environments, the integration of technology into knowledge management processes, particularly in marketing, emerges as a determinant of success, as companies explore the World Wide Web (WWW) to compile, disseminate and exchange information with current and potential customers. Seeking a relationship with these public partnerships of medium- and long-term strategies is the foundation of e-business (Ngai & Wat, 2002).

For this reason, knowledge management systems are of great importance to organizations, because they improve the use and management of information and knowledge. Knowledge management is not easy to define, since it covers a wide range of concepts that pass through the pooling of resources, technologies and organizational practices, and are scattered across several major areas of research.

The present study will cover knowledge management practices assuming a combine perspective of the following scientific fields: information systems, management and marketing.

Although knowledge about the initial references to knowledge management dates back more than 2500 years (Snowden, 2000), this matter was the subject of interest, especially in philosophy and epistemology and only recently gained a prominent place in the organizational context. Since the 1980s, knowledge has been considered for organizational purposes as a "good/asset/capital" allowing the gaining valuable information and assuming the role of an irreplaceable resource, support strategies based on information management and innovation.

A wide range of knowledge systems has been presented. Boisot and Canals (2004) advocate the partition of knowledge in itself, public, staff and common sense. Choo, Detlor, and Turnbull (2000), based on the early work of Boisot, suggest a distinction between tacit knowledge, explicit and cultural turn. Blackler (1995) underlines the existence of knowledge "embodied, embedded, embrained, encultured, and encoded," each considers the content and processes as launching platforms.

A closer look at these models allows the distinction between tacit and explicit knowledge as well as present a list in which each of these concepts appears associated with a set of keywords (see Table 1).

Table 1- Basic characteristics of data, information and knowledge

<b>Data</b>	<b>Information</b>	<b>Knowledge</b>
Explicit	Interpretable	Tacitus / embedded
Exploitable	Explored	Created
Usable	Built	Reconstructed
Acceptance	Confirmed	Deformed
Based on previous models	Amendment of previous models	Develop new models
Without learning	Single-step learning	Several steps of learning
Directorate	Communication	Based on the sense
Prescriptive	Adaptable	Seminal
Efficient	Effective	Innovation / redundancy
Predetermined	Restricted	Flexible
Without context	With context	Within the context
Technical systems	Socio-technical systems	Social networks

Source: Adapted from Galliers and Newell (2001)

Looking at the evolution of knowledge management in historical terms, there are three generations of knowledge management. The first generation of knowledge management was from 1990 to 1995, when there were many attempts to define knowledge management and the potential benefits of this research for companies and the design of specific projects were emphasized (Nonaka, 1994; Wiig, 1993).

At the same time, there was significant progress in artificial intelligence on knowledge management practices such as acquisition and storage of knowledge (Metaxiotis, Ergazakis, & Psarras, 2005).

The second generation of knowledge management began in 1996, and brought the emergence of new faces in knowledge management. This phase is also known for the adoption of multiple sources of knowledge management and the rapid integration of knowledge management practices in everyday organizational discourse.

During this period, the research explored the definition of knowledge and corporate philosophies (Grant, 1996; McAdam & McCreedy, 1999), building systems (Alavi & Leidner, 1999; Lam, 2000), development of conceptual models (Chua & Goh, 2009; Holsapple & Singh, 2000b), defining operations and practices and integration of advanced technologies (Metaxiotis, et al., 2005)

While the second generation's emphasis is on changing the level of systemic organizational development, the third generation – new millennium - seems to emphasize the link between knowledge and action (Metaxiotis, et al., 2005) and presupposes that knowledge is inherently social, cultural and, as such, any organizational knowledge can only be achieved through changes in business and organizational practice.

When reviewing the existing concepts of knowledge, is evident that IT and information systems occupy a central position in relation to the dimensions of possession and knowledge creation, as well as the spread of knowledge and process management (Metaxiotis, et al., 2005).

One of the challenges it poses for organizations, as part of knowledge, is to acknowledge what each employee knows, such as applying the knowledge and what is his or her personal contribution to the generation and application of knowledge in the company. This is one of the challenges that can be overcome by the adoption of technology tools fostering the relationship and constant interaction among employees.

Modern technology facilitates the integration of dispersed knowledge, accelerates the replication of best practices, eliminates time and geographical constraints, and facilitates use and access by multiple users. However, controversy persists about the role that

information technology should play in knowledge management. The positions are extreme: some overvalue and others underestimate it, requiring a balance in order to identify opportunities where IT can facilitate knowledge management practices (Wild & Griggs, 2008).

Wild and Griggs (2008) tried to understand the identification and classification of knowledge and the determination of its specific value to an organization, by assessing the sources of knowledge and application opportunities. These authors started from the concept that despite current IT infrastructure to allow the organization, formalization and distribution of organizational information, few are able to pass the stage of the generation, application and development of organizational knowledge. In this sense, these authors developed a three-dimensional model composed by the knowledge management life cycle, the knowledge management internal level and knowledge management targets to identify opportunities for IT.

According to (Wiig, 1993) knowledge management rests on three pillars, which are reflected in the ability to: (i) exploit knowledge and its appropriateness to context and organization, (ii) to estimate the benefits and value of knowledge, and (iii) actively manage knowledge. The author concludes that each of these pillars requires a range of knowledge associated with the use of methods, tools and technologies, and approaches to learning.

Some of the more recent work in this area has foreshadowed the importance of assessing not only the way it handles the lifecycle and level of knowledge management of the organization, but also how to integrate its goals into IT and global firm strategies (Cetindamar, Phaal, & Probert, 2009; Chen & Lin, 2009; Fan, Feng, Sun, & Ou, 2009; Hsieh, Lin, & Lin, 2009; Lehtimäki, Simula, & Salo, 2009; Zheng, et al., 2009).

According to Anderson, Hansen, Lowry, and Summers (2005), many companies have adopted e-business, leveraged critical business processes, explored the Internet as a medium for transaction management, and allowed access to a wide range information, services and even remote access payment.

This revolution is confirmed by the growing number of resources that can be searched, managed, created and/or consumed in the virtual environments of the Internet, Intranets and Extranets. As described in Valacich and Schneider (2010), there is a wealth of



opportunities and methods for exploiting the potential of the Internet and it is up to each company to evaluate their suitability for e-commerce.

Strauss, El-Ansary, and Frost (2003) present e-business as the role model based on digital features and marketplaces that allows companies to attract and retain customers and to suit business partners to their characteristics.

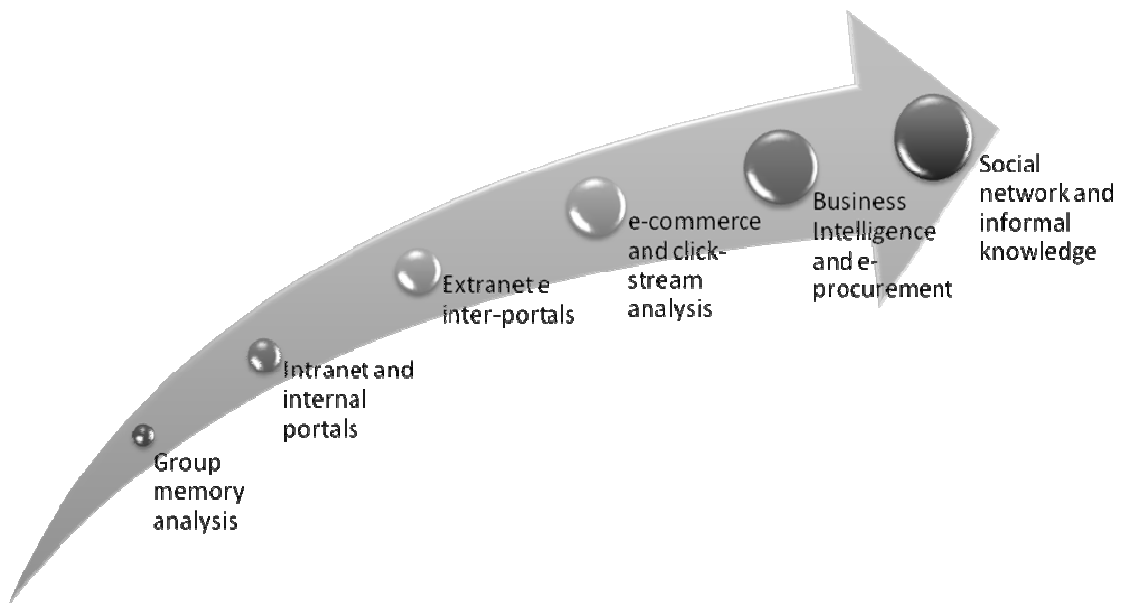
In a similar mode to the one proposed by Valacich and Schneider (2010), these authors believe that e-business in the digital network enhances four components: (i) the inputs of the business, whether they take on characteristics of raw materials or other information, (ii) resources, both human and capital, (iii) the practices of e-commerce, and (iv) management and analysis of processes taking as a tool to support customer feedback.

As Internet-driven technology develops, the concept of e-business has been expanded to include new components related to communications and online transactions, integrating all business stakeholders such as customers, suppliers, government agencies, financial institutions, officials and the public (Watson, Zinkhan, & Pitt, 2000). Thus, e-business can be regarded as broader than the mere use of the Internet for the exchange of goods and services (Rao, 2002).

As virtual business management evolved, knowledge gained relevance in the context of the management as science and a means of supporting strategic definition (Tsoukas, 1996). As described in Oppong, Yen, and Merhout (2005) knowledge management has become a valuable asset for organizations with the awareness of the potential information on the environment.

From the perspective of management initiative, knowledge management has adopted a set of technologies and takes advantages of inbreeding processes, such as innovation to increase the application and use of knowledge. Therefore, the digital age's influence on the evolution of knowledge management evolution is depicted in the following figure.

**Figure 1 – Digital era's impact on evolution of knowledge management**



Source: Adapted from Kalakota and Robinson (2000)

The evolution depicted in Looking at the evolution of knowledge management in historical terms, there are three generations of knowledge management. The first generation of knowledge management was from 1990 to 1995, when there were many attempts to define knowledge management and the potential benefits of this research for companies and the design of specific projects were emphasized (Nonaka, 1994; Wiig, 1993).

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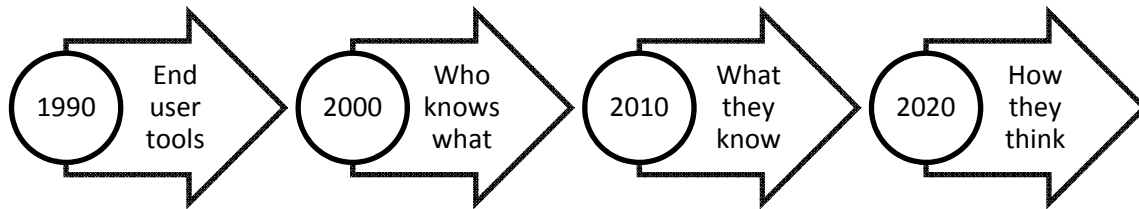
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Figure 1 occurred in the last 20 years and justifies the importance of knowledge management in leveraging performance in the e-business context.

Gottschalk (2007) suggests an integration of IT and knowledge management that has increased over the past few years, as shown in the following figure, although it can now find companies on the first two phases.

**Figure 2 – Integration of IT and knowledge management**



Source: Adapted from Gottschalk (2007)

To Gottschalk (2007), a knowledge management systems will only improve the performance of e-business if it can meet certain requirements: (i) it must support the management model for the entire set organization, (ii) it should be a source of improvements through the redesign of processes where needed basic activity of e-business, and (iii) technological systems-based knowledge management should always accompany the technological evolution itself, given that the most current and powerful tools tend to improve the performance of e-business. Thus, some organizations, instead of acquiring highly complex and sophisticated IT systems that support the KM, explore the components of the knowledge management cycle through the use of ICT features. This will be the starting point of the research model that will be presented in the next section.

## **Evaluation Framework and Hypotheses**

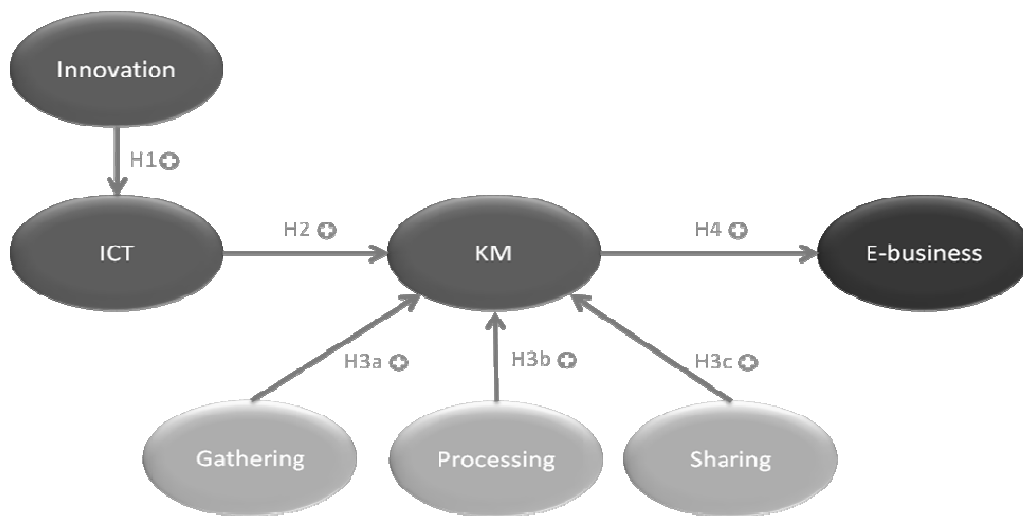
The digital era presents enormous challenges, especially if firms consider the gathering of information about customers, suppliers, markets, and supply, and the easy processing of information about company processes, products, and services.

Literature review showed evidence that organizations tend to change to meet the increasing competitiveness of global markets, applying new business models and more innovative practices (Strauss, et al., 2003; Wu, Ong, & Hsu, 2008).

In order to address these issues, the study analyzes the developments and definitions of knowledge management and puts forward a conceptual model that integrates knowledge management cycle activities and evaluates its impact on e-business practices.

However, the components that integrate knowledge management cycle activities are not based on an IT knowledge management system, but combine all informal processes identified inside the firms that contribute to the gathering, processing and sharing of data, information and knowledge through all firm stakeholders.

**Figure 3 – Conceptual Model**



The model is validated by using a structure equation model to test the hypotheses. The measurement model is done by using Confirmatory Factor Analysis (CFA). We will see later that the observable variables (indicators) we selected are measures of latent variables (factors). We assume that innovation and ICT features have a direct effect on knowledge management and e-business activities. Therefore, we assume that the online firm activities are explained not only by the knowledge management strategy, but also by integrated ICT and innovation components.

Table 2 summarizes the set of hypotheses, considering as a theoretical base for the development of these postulates the literature on knowledge management in fields such as management and information systems.

**Table 1 – Hypotheses**

Hypothesis	Literature Support
<b>H1: Innovation practices have a positive impact on adoption of information technology and communication.</b>	(Caloghirou, Kastelli, & Tsakanikas, 2004; Chang & Chen, 2004; Chen & Lin, 2009; Hurley & Hult, 1998; Lee & Tsai, 2005; Tajeddini, 2009)
<b>H2: The adoption of information communication technology has a positive impact on knowledge management.</b>	(Giraldo, 2005; Metaxiotis, et al., 2005; Gottschalk, 2007)
<b>H3: There are three dimensions of knowledge practices that gave rise to the informal knowledge management cycle.</b>	(Huysman & Wit, 2000; Kwan & Cheung, 2006; Tiwana, 2001)
<b>H4: Knowledge management has a positive impact on the development of e-business activities.</b>	(Gottschalk, 2007; Singh, Iyer, & Salam, 2009) (Holsapple & Singh, 2000a)



The first hypothesis sought to identify a positive impact on innovation processes, as an agent driving the adoption and use of ICTs. The second hypothesis seeks to confirm the inference that there is a positive impact of ICTs on knowledge management.

The third hypothesis is subdivided into three sub-hypotheses and measures the impact of the three components of the cycle of knowledge to the global process of knowledge management and its perspective a positive impact, following the results found by other researchers.

The last hypothesis reflects the main research question of this work and attempts to validate the existence of a positive impact of knowledge management in the development of e-business organizations.

## **Methodology and Results**

To validate these assumptions, data was collected from a sample of 2.248 European and American firms from two services industries and covering seven dimensions of analysis: (1) ICT infrastructure and e-business software systems; (2) automated data exchange; (3) e-standards and interoperability issues; (4) Innovation activity of the company; (5) ICT skills requirements and ICT costs; (6) ICT impacts, drivers and inhibitors; and (7) background information about the company.

The decision to adopt Europe and North America as a field of study came from the limited amount of comparative research on knowledge management on the internet (Zhu, Kraemer, & Dedrick, 2004).

The data employed in the empirical research comes from e-Business W@tch annual survey (2007), covering eight countries: the USA, Poland, France, Germany, Spain, Sweden, the UK and Italy.

Initially we used a set of descriptive statistics that allowed for a greater sensitivity to the data (Sekaran, 2006). Such descriptive statistics also acted as guide for the multivariate statistics (Hair, Anderson, Tatham, & Black, 1998). Some notes about the sample used. Around 54.4% of the firms were small or micro-sized.

Some authors have noted that the size of the company constrains online activities (see Dewett & Jones (2001)). In contrast, some studies have reported that, in terms of digital

environments, the differences in the size of organizations do not make sense. This lead to questioning firms about their perception of firm' size influence on e-business activities. Only the Polish respondents consider firms' size as a relevant restraining factor of e-business activities.

As it seeks to share and disseminate information and knowledge, digital security emerges as a relevant aspect to consider in knowledge management in virtual environments. For that reason, it has drawn attention from both businesses and academic researchers.

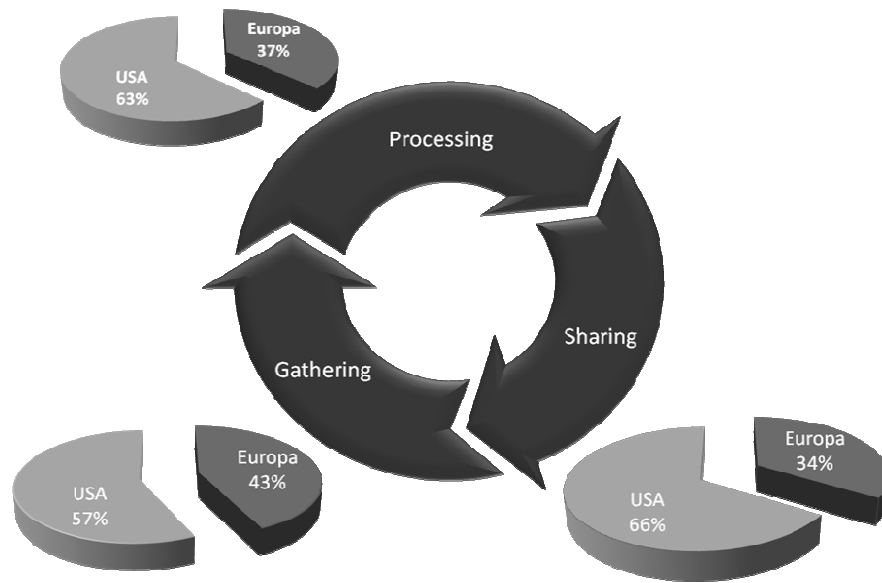
Thus, respondents were asked about the importance of security and privacy in the development of e-business activities. USA firms expressed the most concerns with security and privacy, closely followed by German and French firms.

One of the points made in the valuation model of technological sophistication (Colecchia & Schreyer, 2002) is the way it handles the transmission of information within and between firms.

The results suggest that recourse to the use of electronic transmission as the main medium has its greatest expression in Sweden and the UK, When measuring combine electronic and paper source transmission of information greater expression was found in the United States of America and Germany firms. These two countries are those in which the use of traditional media (verbal and paper) does not correspond to more than 50% of the processes of information transmission.

An inspection of the informal practices of the knowledge management cycle in these companies is apparent the following figure.

Figure 4 – KM cycle activities

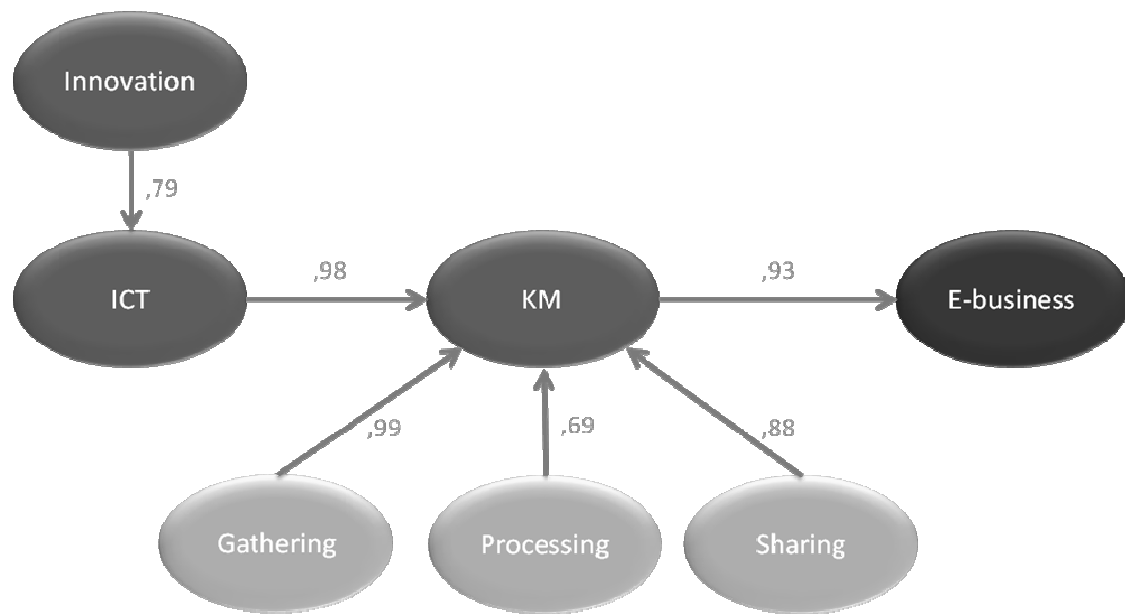


The model was estimated by the maximum likelihood method in the AMOS package. The model goodness of fit may be considered acceptable according to the values of some goodness-of-fit indexes, although the chi-square test statistic ( $\chi^2 = 1586,418$ ; p-value = 0,000) is significant, implying a bad fit. However, this test is known to have serious limitations — namely its dependence on the sample size and on the number of indicators. In general, for large sample sizes the chi-square statistic is significant, and in the present case the sample size is very large.

Several goodness-of-fit tests were conducted to access whether the empirical model could explain the observed data. The measures for global model fit (below) suggest that our model fits the underlying data quite well and that the hypothesis paths were all statistically significant.

After global model fit has been assessed, the numerical results were evaluated to test their support of the research question. The numerical results can be obtained directly from the path coefficients of the structural model (**Erro! Auto-referência de marcador inválida.**).

**Figure 5 - Structural equation model and estimation results**



Index	Value for the model	Reference value (Hair et al. 1998)
p-value	0,000	$p > 0.05$
RMSEA	0,042	$< 0.05$
NFI	0,801	$> 0.8$
TLI	0,801	$> 0.8$
CFI	0,833	$> 0.8$

Our findings support the conceptual framework regarding to all hypotheses. Thus, this finding lends empirical support to the concept that e-business activities can be improved by exploring the information knowledge management. Similarly, gathering, processing and sharing contribute 99%, 69% and 88% to the knowledge management construct, respectively.

The significant relationship achieved between Innovation and ICT (0,79) and the positive direct impact of ICT in informal KM (0,98) supports the idea that a non traditional knowledge management system can be adopted by integrating innovation practices, concepts and processes, and technological tools.

A split structural equation model was also performed to analyze the possible difference among regions, especially Europe and North America. Nevertheless, the model achieved was not reliable and for that reason no remarks can be presented.

## Conclusion

As Malhotra (2000) suggested, little empirical evidence supports the direct correlation between IT investments and organizational performance or firms' own knowledge management. However, the success of organizations depends on and can be optimized by the way in which employees use the knowledge in the processes of value creation. As Gottschalk (2007) noted, this function becomes more complicated in e-business, because the technological components of the Internet combined with their own Website makes knowledge management a daily challenge. Thus, it is important to answer to question: *how do organizations take advantage of knowledge management by integrating new technology tools and innovations to improve their e-business activities?*

The literature review showed that only a few works have taken a corporate perspective to examine the contributions of knowledge management to e-business performance. However, most of these works were confined to specific industries or countries. The analysis of the adoption and use of informal knowledge management processes inside firms is even slighter. Therefore, the goals of this study were therefore: (1) to determine whether the implementation of ICT and innovation is positively linked to knowledge management; (2) to determine which of the components of the knowledge management cycle have more impact; and (3) to identify the relationship between knowledge management and e-business activities.

The main results suggest a strong positive relationship between knowledge management and e-business as well as a positive impact of ICT and innovation process on the knowledge management cycle. The analysis also reveals that in digital environments the gathering and sharing of activities has a greater impact on global knowledge management than processing activities do. The analysis reveals that no relationship can be established between a firm's practices on the Internet and its country of origin.

This work contributes to the theory of knowledge management by considering ICT tools and innovation as drivers for knowledge management processes, applied to the European and American realities. Simultaneously, it adds to the knowledge of assessment of informal knowledge management cycle as well as expands the research into the field of e-business. However, these findings should be viewed in light of some limitations. Further work is clearly needed to examine the inclusion of news elements

such as management support to knowledge management initiatives and multi-level analysis of e-business process. Aside from these considerations, it would be interesting to compare the results of online to those of brick-and-mortar firms. Certainly, there is ample scope for further research in this area.

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