

# Information technology as a determinant of organizational learning and technological distinctive competencies

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## Abstract

This study aims to assess the role played by information technology (IT) in organizational learning (OL) considered as a process of knowledge creation and determined by the interaction of stocks and flows variables. We also examine how IT and OL influence both business performance and the development of the technological distinctive competencies (TDCs), as well as the latter's influence on leading the firm towards better outcomes. These relationships have been tested via an empirical analysis carried out with a sample of 140 industrial companies, applying a structural equation linear model according to the Partial Least Squares (PLS) methodology. Our findings allow us to confirm that IT acts as an enabler of the OL process and influences on the development of TDCs, which allow the achievement of a better business performance. Such competencies are also the result of OL, thus demonstrating the influences of them both on perceived organizational performance.

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## 1. Introduction

The study of organizational learning (OL) is relevant as it seeks to respond to the challenges that arise in a constantly changing business environment and can help companies to confront their long-term survival difficulties. OL thus represents a source of heterogeneity and of potentially sustainable competitive advantages, because of the companies' different capabilities for learning and absorbing knowledge (Easterby-Smith, Crossan, & Nicolini, 2000; Lei, Slocum, & Pitts, 1999). The most important thing is not that companies can accumulate knowledge (static focus), but that they are able to learn continuously by creating new knowledge which they transfer and apply (dynamic focus).

The concepts of learning and knowledge creation are often used to describe the innovation process (Nonaka & Takeuchi, 1995). Technological innovation in companies is a learning process through which a flow of new technological knowledge or technological distinctive competencies (TDCs) is generated (Nieto, 2004). The development of this knowledge is path-dependent (Prencipe, 1997) and therefore determined by the company's history and experience, in which OL plays a key role (Dutrénit, 2000). This explains the historic dependence of innovation on what has happened in the past and its irreversibility with respect to the technological path followed (Pavitt, 1987). In short, companies that have developed a learning ability in the past will have a greater capability to innovate in the present.

Moreover, the contributions from the Resource-Based View (RBV) approach and its extension, the Knowledge-Based View approach, suggest that competitive advantage stems from the company's capabilities and skills, with learning becoming a fundamental strategic aspect. Although their theoretical frameworks are different, they share a series

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of similarities which enable their integration in a global theory whose contemplation could imply the appearance of a new paradigm (Mahoney, 1995).

As a result, this research takes the current position concerning Organizational Learning and the Knowledge-Based View as its reference framework. Thus, using a dynamic model that integrates organizational learning and knowledge creation (OL–KC), this article aims to analyze how OL influences the process of TDCs. In this respect, these competencies have a mediating influence on the impact of OL on perceived business performance (PERF). At the same time, we will also examine how knowledge management technologies will contribute dynamically to the success of this process. So, it is via these complementary resources, such as OL and TDCs, that information technology (IT) can be converted into a competitive advantage for the company.

To achieve the proposed objectives, this paper is organized as follows: to begin, we will describe the theoretical framework which we have applied in this research and which we have followed in order to propose a series of hypotheses used to form the research model. Following this, we will stop a while to describe the sectors that are the object of this study and the chosen sample of companies together with the design of the questionnaire and the planning of the fieldwork. Next, we will present our results, and a discussion of them based on the analysis of data collected from 140 manufacturing firms. Finally, the paper will show the conclusions and implications, identifying limitations and providing guidelines for future research.

## 2. Organizational learning and knowledge creation

Decades of thought have made the scarce degree of consensus about the OL concept obvious, while several disciplines have contributed to its literature thereon. As a result, research has advanced very slowly as a consequence of the complexity of the subject under study and the absence of a solid common starting point. The literature, then, has given many definitions of OL and, consequently, there is currently confusion about what the term means (Crossan, Lane, White, & Djurfeldt, 1995).

The primary difficulty in reaching a useful definition is to distinguish the consequences of OL from the learning process (Robey, Boudreau, & Rose, 2000). This research is focussed on learning in organizations, which is understood to take place in organizations, in the sense of an activity or a process as indicated by Örténblad (2001). OL in this study is as a dynamic process of knowledge creation generated at the heart of the organization via its individuals and groups, directed at the generation and development of distinctive competencies that enable the organization to improve its performance and results. The key characteristics of this definition deserves attention. First, OL is an organizational process that might occur at individual, group and organiza-

tional levels (Crossan, Lane, & White, 1999). Second, OL is seen as a means to develop competencies that are valued by customers, are difficult to imitate, and hence contribute to competitive advantage (Crossan & Berdrow, 2003). Finally, there is a significant relationship between OL and firm performance (Tippins & Sohi, 2003).

March (1991), relying on Holland's (1975) terminology, proposes the existence of two types of basic activities for learning in the organization: exploration or feedforward and the exploitation or feedback. OL constitutes a dynamic process of knowledge creation through levels which create a tension between the incremental or amplifying logic, implying exploration or new assimilation of learning (feedforward), and the reductive logic, involving exploiting or using what has been learned (feedback). Exploration includes characteristics such as investigation, variation, risk, experimentation, flexibility, discovery and innovation. It consists in experimenting with new possibilities, and its results are uncertain, take a long time and are often negative. It is usually associated with learning transfer from the individual sphere to the collective sphere, which in itself constitutes a process of knowledge creation.

Exploitation is related to choice, efficiency, selection and execution. It consists in the improvement of existing competencies and technologies by using what has already been learnt, that is to say, by adaptation. Its results are predictable, achieved quickly and positive. It could be considered as single loop or adaptive learning, with this one being conceived as the exploitation of core competencies or routines (Nelson & Winter, 1982), which do not alter the organization's nature or activities.

March (1991) states that both activities, exploration and exploitation, play a key role in the organization and there must be an adequate equilibrium between both of them. This way, organizations excluding exploitation suffer the costs of experimentation without gaining many of its benefits, and those excluding exploration will be trapped in a non-optimum stable equilibrium.

## 3. Research model and hypotheses

The 4I model of OL (Crossan et al., 1999), used in this research to analyze OL as an OL–KC process, defines OL consisting of four related (sub)process: (1) intuition is a preconscious process taking place in the individual level; (2) interpretation, as a first type of transmission of elementary cognitive elements, acts as intermediary between individual and group levels; (3) integration process, or how what it is interpreted is inserted in the organization, acts as a link between group and organizational levels; and finally, (4) institutionalization process, or how changes are consolidated, is exclusive for the organizational level. This model has been operationalized using the Strategic Learning Assessment Map (SLAM) proposed Bontis, Crossan, and Hulland (2002). The SLAM matrix integrates the key

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