The mediating role of information technology in the decision-making context

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Abstract

Purpose – This paper seeks to contribute to the management literature by providing a theoretical frame. The authors analyze the dynamic relationship and interactions that exist between three organizational capabilities (collective intelligence, knowledge management and innovation) and the correlation with decision-making effectiveness. The aim is identifying the interaction between the different dimensions and the mediating role of information technology.

Design/methodology/approach – The authors’ research question is to determine how organization can combine these capabilities to create superior value and to understand the role played by information technology. Their conceptual model is founded on the interconnection between different dynamic propositions.

Findings – The authors find in the review of the literature that the different capabilities are interdependent and have a positive association with effective decision making and superior value creation.

Research limitations/implications – The authors’ theoretical model could incorporate other organizational capabilities, such as organizational performance. Additionally, ground experimentation and simulation are needed to confirm their proposal.

Practical implications – The findings carry theoretical implications for the decision-making literature as they extend the scope of the research on information technology management. Moreover, this research allows managers to recognize better how to manage their employees effectively and to extend their strategy space with the aim of identifying new managerial practices.

Originality/value – The conceptual model links various organizational capabilities with strategic notions in the management of organizations. The goal of this theoretical article is to understand how three organizational capabilities affect firms’ decision making and how information technology can optimize the process.

Keywords Decision making, Information technology, Collective intelligence, Knowledge management, Innovation

Paper type Conceptual paper

1. Introduction

Organizations’ environment is highly dynamic, increasingly complex and undergoing perpetual change. The acceleration of technological progress leads to the omnipresence of information and a multiplicity of information sources. In a constantly changing context, actions or decisions become more complex. Moreover, many decision makers today generally have to work with mountains of heterogeneous data and are not able to make correct and rapid decisions (Kennerley and Mason, 2008).

These activities require a quality of knowledge that provides the basis for a strategic and effective decision. Furthermore, the mobilization and interconnection of the individual reflections creating a group’s intelligence have a positive relation with the decision-making process. Additionally, the creation and exploitation of ideas, products and resources with the aim of achieving higher levels of organizational...
effectiveness enable decision-making activities. The information technology (IT) play a role of mediation in order to exploit the superior value created.

This paper contributes to the management literature by providing a theoretical frame. We postulate that if an organization is able to mobilize collective intelligence, knowledge management (KM) and innovation it can create a context “favorable” for making a strategic decision. We analyze the proposed capabilities in order to establish the dynamic relationship that exists between them and to show how they are distinct but related and involve dynamic interactions. These interactions create superior value and positively affect the effectiveness of the decision making.

We will start by presenting the theoretical background. Then we will suggest a conceptual model emphasizing the connection between the capabilities and the mediating role played by IT. A discussion of the research and managerial implications will be presented. Finally, we will suggest the limitations and the research perspective.

2. Literature review
The key question that we use to organize our reflection is “How can an organization mobilize the three organizational capabilities to create superior value to ensure strategic decision-making?” In order to answer that question, we think at least that the different concepts have to be clarified in order to present the theoretical background.

2.1 Organizational capabilities
A very large part of the literature points to the importance of the organizational capabilities’ paradigms. Resource-based view of the firm is a recognized field of research (Barney, 1991). Organizational capabilities have extended this field by taking into account the dynamic environment’s evolution (Teece et al., 1997), allowing apprehending sources of long-term competitive advantage (Amit and Schoemaker, 1993).

In all the organizations we are brought to treat information and knowledge covering several diverse and complementary functions. The essential problem today is more connected to the management of the knowledge than to the knowledge. From there emerge the importance of the first dimension “KM.” The second dimension “collective intelligence” establishes the link between the various individual intelligences. The process of optimization constitutes the main part of indicators today which are used to measure firms managerial efficiency. The third dimension, covered by the concept of innovation, establishes one of the fundamental elements serving to identify the emergence of new ideas, products and areas of governance.

First, collective intelligence is the paradigm allowing actors to solve specific problems and emerges from the collaboration of individuals (Bonabeau, 2009). Heylighen (1999) considers that “collective intelligence is defined as the ability of a group to solve more problems than its individual members.” Collective intelligence exceeds the sum of the individual performances (Malone, 2008).

Regarding collective intelligence, the focus is on the impact of the intelligent exploitation of information by a group of human actors to resolve a given problem. This takes place in an organizational context governed by rules of functioning and can be optimized by leaning on technological tools.

Second, KM is a process consisting of several steps that provide added value in organizations’ management. According to Šikýř (2010), “the purpose of knowledge is to improve the storing, creation, sharing and use of knowledge in the organization and by thus improve performance of individual employees and the organization as a whole
entity.” We find various taxonomies of knowledge in the literature. The most used is the classification proposed by Polanyi (1967) and Nonaka (1994), which focusses on tacit and explicit knowledge. On one hand, the evolution of information to become knowledge is possible when an individual undergoes an “intellectual,” mental and cognitive process (tacit knowledge). On the other hand, the generated knowledge becomes information, which will be exchanged and communicated in different forms (explicit knowledge). The KM success model is founded on the system, knowledge and service quality (Jennex and Olfman, 2008). Successful KM efforts must also convert tacit knowledge into explicit knowledge, creating superior management value.

Finally, innovation is the exploitation of ideas, products and resources allowing the achievement of higher levels of organizational productivity and growth. Innovation strategy and orientation are a “non-linear” process because of several parameters. The actors who intervene in the organization, the external and internal environment and the sources of information have a direct influence. The innovation process is anticipated by social actors’ collaboration. Innovators are not individuals who can create novelty independently (Kaufmann et al., 2002). According to the multiplicity of innovation sources, organizations are obliged to rely on both internal and external sources to innovate. Furthermore, organizations can innovate by exploiting and combining their existing knowledge or by creating new knowledge.

Innovation is an opportunity for organization development and a source of competitive advantage (Schumpeter, 1934) as well as a very complex process (Becheikh et al., 2006). Moreover, innovation activities are perceived in the literature as the key source of long-term organization success (Fagerberg et al., 2005).

We summarize the definitions of the three organizational capabilities in Table I.

The managerial decision activities are characterized by “uncertainty” and “complexity.” The exploitation of “resources” and “capabilities” enables managers making better decisions.

### 2.2 Decision-making activities

Many researchers consider decision making as the process of choosing among different alternative the solution which is appropriate in the context of problem resolution. Precisely, according to Zeleny (1982, p. 84), decision-making process is “an act of selecting the most desirable alternative and treats it, instead, as a process: a dynamic and interrelated unity of predecision, decision and postdecision stages.” In a chronological point of view, researchers have identified necessary phases to accomplish this process. Simon (1965) identifies three phases (intelligence, design

<table>
<thead>
<tr>
<th>Organizational capacities</th>
<th>Definition</th>
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<tr>
<td>Collective intelligence</td>
<td>The paradigm allowing actors to solve specific problems, emerging from the collaboration of individuals, creating group's intelligence</td>
</tr>
<tr>
<td>Knowledge management</td>
<td>The process that facilitates activities related to acquiring, creating, diffusing and developing knowledge in organizations</td>
</tr>
<tr>
<td>Innovation</td>
<td>The creation and exploitation of ideas, products and resources allowing the achievement of higher levels of organizational productivity and effectiveness</td>
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Table I. The three organizational capabilities’ definitions
and choice). Newman (1971) suggests five different steps (recognition of situation, identification of alternative, evaluation, choice and implementation). Mintzberg et al. (1976) focus on three phases: identification, development and selection phases. Whatever is the phase, decision makers have to compose with multitude and heterogeneous information. They have continually to allocate the necessary and pertinent organizational resource to achieve their objectives.

Our study focusses on decision making because this strategic and multidisciplinary domain has a very important impact on the managerial process performance and also on the future of the organization. We will study the impact of different organizational capabilities and their influence on this process.

3. Conceptual model of research

In the conceptual model we tried to accentuate the interconnection between the organizational capabilities and the individual and collective impact on decision making. We construct a model which helps us to demonstrate our research propositions. The \( P1a-P1c \) concern one organizational capability and the existing correlation with decision making. \( P2a-P2c \) analyze two organizational capabilities and decision making. \( P3 \) takes into account the interdependence between all the capabilities and the linkage with decision making:

- \( P1a. \) Collective intelligence will have a positive correlation with strategic decision making.

- \( P1b. \) KM will have a positive correlation with strategic decision making.

- \( P1c. \) Innovation will have a positive correlation with strategic decision making.

- \( P2a. \) Collective intelligence will influence knowledge management, creating superior decision-making value.

- \( P2b. \) KM will influence innovation, creating superior decision-making value.

- \( P2c. \) Collective intelligence will influence innovation, creating superior decision-making value.

- \( P3. \) Interaction and interdependence between collective intelligence, KM and innovation will be positively related to decision-making strategies.

3.1 Organizational capabilities and decision making

\( P1a. \) Collective intelligence will have a positive correlation with strategic decision making.

Collective intelligence helps the emergence of a decision and becomes essential in providing intellectual cooperation and collaboration. In effect, collective intelligence provides very important support for decision making, based on information exchange between actors (Dawn, 2010). This can be possible, for example, by the identification of actors who find and collect information, actors who analyze information and actors who give their opinion and point of view.
The "traditional" vision of collective intelligence has transformed into how individuals can produce strategic decisions and identify the opportunities available in the market. The "new" vision is founded on group intelligence, which is considered more productive than that of isolated individuals. Collective intelligence is based on actors' collaboration in a working context and can improve competitiveness within organizations and become a critical factor in strategic decision making (Trigo and Coelho, 2011) (Figure 1):

P1b. KM will have a positive correlation with strategic decision making.

Decision making requires a quality of information that provides the basis for a decision. According to Jennex (2008), “KM can be defined as the practices of selectively applying knowledge from previous experiences of decision making to current and future decision-making activities with the express purpose of improving organizational effectiveness.” The basis of the work in this regard is the conversion of data into information and information into knowledge with the aim of enabling strategic decisions to be made.

Organizations can measure the decision-making process by specifying whether they are using past knowledge to make decisions. The issue is to determine whether the KM provides appropriate knowledge. The implementation of successful KM has a direct impact on organizations by providing “increasing decision-making effectiveness” (Jennex and Olfman, 2008). The quality of knowledge can allow the decision maker to use appropriate parameters that consistently create new knowledge (Choo, 1998) (Figure 2):

P1c. Innovation will have a positive correlation with strategic decision making.

The decision-making process and innovation have a mutual effect and are closely related (Du et al., 2007). On one hand, the decision-making framework identifies the most important choice that can contribute to a successful innovation. In effect, the choice of pertinent and effective ideas or solutions and their implementation and testing provides a source of innovation. At the most basic level, innovation projects require calculated and intelligent decisions to be taken. The emphasis is on the innovation decision and how organizations make the decision to innovate. On the other hand, innovation produces new situations and practices that in general are a result of the problem-solving context (Isaksen et al., 2010). The aim is to determine the effect of novelty creation by understanding how the innovation process impacts on the decision makers and manager's activities (Figure 3).

Figure 1.
Positive linkage between collective intelligence and decision-making activities

Figure 2.
Positive linkage between knowledge management and decision-making activities
3.2 Interaction between the organizational capabilities and decision making

P2a. Collective intelligence will influence KM, creating superior decision-making value.

Organizations are increasingly turning to the implementation of the collective intelligence process to improve their KM success, whatever their size or business sector (King and Grover, 1991). In the basic acceptation of KM, we accentuate that this process facilitates the activities of acquiring, creating, diffusing and developing knowledge by individuals or groups of individuals (Demerest, 1997). Some empirical studies confirm a significant correlation between collective intelligence and KM. Specifically, both Svobodová and Koudelková (2011) and Kapetanios (2008) examine the aspect of collective intelligence that can support “human-generated knowledge.” Collective intelligence applications need to center around user-defined knowledge that can be exploited to support decision making. Furthermore, KM is related to how to manage the collective expertise, allowing an organization to transfer knowledge among its workforce. The “intelligent” enterprise is built on this dimension (Zara, 2011), which produces superior value (Figure 4):

P2b. KM will influence innovation, creating superior decision-making value.

KM results from the coordination of human actors, technology and functional processes providing innovation (Dalkir, 2005). Various researchers emphasize the fact that the success of KM is potentially related to organizational innovation, competitiveness and development. Specifically, Chen et al. (2010) examine in a pragmatic study the necessary basis and variables for the implementation of KM strategies in the innovation process. Additionally, in a qualitative research, Hongli et al. (2011) develop a theoretical model for explaining the relation between KM and open innovation.

The innovation projects are alimented by internal and external knowledge exploitation. Managers and decision makers perceive KM as a strategic tool allowing the creation of new and better products or ideas (Darr et al., 1995) (Figure 5):

P2c. Collective intelligence will influence innovation, creating superior decision-making value.
As stated above, the mobilization of collective intelligence means the use of tools and methods that allow the connection and relationship between actors to create superior group intellectual cooperation. This cooperation and intelligent collaboration represent a source of innovation for companies. According to Dawn (2010, p. 134), “the concept of collective intelligence is now being explored by businesses interested in using it for collaborative innovation.” Additionally, the variety and heterogeneity of “cognitive styles” of firm members result in higher levels of innovation (Miron et al., 2004).

The question is how professionals work and also how they mobilize creativity, ideas, talents and experience together in order to take relevant new paths in terms of the organization’s strategy (Figure 6):

\[ P3. \text{Interaction and interdependence between collective intelligence, KM and innovation will be positively related to decision-making strategies.} \]

An interesting perspective on KM, collective intelligence and innovation was presented by Svobodová and Koudelková (2011), showing the important correlation between different hypotheses. The authors postulate that “Knowledge management is an appropriate tool for improving innovation management and that Collective Intelligence helps to facilitate the management of Innovation in the company.” Furthermore, the association of these organizational capabilities in an organization creates a superior value in strategic decision-making activities. The consideration of the relation between the three capabilities may positively affect a firm’s strategic decision-making success and financial performance (Boulesnane et al., 2012).

The Figure 7 illustrates the conceptual model and indicates the link between the organizational capabilities and the positive relation that exists with decision making.

In this context, IT ensures the interface between the organizational capabilities and decision-making process in order to optimize and capitalize the created superior value.

4. Mediating role of IT

4.1 IT and organizational capabilities

The advent and development of the IT has considerably modified the management’s processes and the functioning modes of organizations. The term IT cover organization

![Figure 5. Connection between knowledge management and innovation, creating superior decision-making value](image)

![Figure 6. Connection between collective intelligence and innovation, creating superior decision-making value (P2c)](image)
that uses technical and technological equipment’s to create, retrieve and communicate information (Bocij et al., 2009). The increasing integration and development technological instruments in organizations could be explained by the facts of accessibility, diversity and heterogeneity of information as well as the evolution of numerical supports.

Modern management of either large or small and medium companies relies heavily on informational and human capital. Many changes have considerably increased the value of such capital within managing processes. It could be argued that phenomenon such as markets globalization; human resources mobility and general development have accelerated competition that requires more discipline.

Business activities are more and more considered on a collective approach. The implementation of IT can optimize collective intelligence process in order to develop human performance and intelligence (Scarlat and Măries, 2009). Taking in consideration the social system and organization’s actors could be done through these technologies allowing the management of representing social actors from their professional environment.

These representations take place in the form of information and dynamic knowledge, and even a strategic one. IT provides a KM system based on knowledge optimization methods. The aim is to capitalize tacit and explicit knowledge, both at the internal and external organizational levels.

Furthermore, the innovation process is depending more and more on technology progress and will more reflected in the longer run. Facing new socioeconomically requests, today’s technology is a need that emerge and build itself through time. Recognizing technology’s side this is linked to innovation help users to organize daily actions taken within their organizations and it also give them the opportunity to reflect themselves in the longer term. Basing on technological tools is finally understanding and monitoring the way that innovation responds to needs and how adequate it is with the feasibility and the actors’ past experience.

4.2 IT and decision making

In the process of decision making, for human actors, difficulties are due essentially to the heterogeneity of information and knowledge manipulated. The evolution IT systems and subsystems, the nesting of qualitative and qualitative indicators, the relatively limited medium and long-term vision, and even the short term one, and
the diversity models used in treating information reflection organization activity. The effect induced by these difficulties is heavily reduced and even controlled by the integration of IT (Laudon and Laudon, 2011).

The use of a mediation technology designed to optimize the intellectual work in this context and therefore lead decision makers have information useful and in a timely manner. The advantage of technological tools to aid the decision lies in the accompanying management and treatment decision-making problems. They remain of great interest when the parameters involved are multiple and are thus designed to minimize the risk of errors.

The exploitation of IT is based on a division of tasks between human actors and technological systems. The latter play the role of mediation. This is specifically to store and analyze large volumes of data to help managers to seek solutions in the context of problem solving. Analysts and policymakers deal with operations “smart” and “quality,” in relation to the interpretation of results provided by these technological systems (Harris et al., 2008).

Technologies and information systems provide decision support on the relevant indicators such activity through the creation of business dashboards, reporting, data mining, software experts and specialized software.

The IT certainly favors these different approaches through the provision of information and knowledge relevant and quality at all times and all actors in the context of support decision making. Nevertheless, problems related in particular to the multiple levels of interpretation of decision problems still remain. Decision-making processes are becoming more complex as they integrate heterogeneous information and knowledge often semi-structured. Additionally, the diversity of players who can produce and/or interpret the information and knowledge generated.

The objective is to create a digital work environment whose sources of information come from the interaction and the dynamic link between the different organizational capabilities. The contents of this environment will consist of both operating information related to various dimensions: human, organizational and technological. Due to their content and structure, such information “heterogeneous’ will be structured to be exploited by decision makers. This can result in the establishment of “informational-hub” in which will be pooled information characterizing the entire activity of the organization, but also the various specialized software available to the various players in the organization, because diversity fact of information’s needs, they cannot be covered in one system (Figure 8).

We will present the research implication at both the theoretical and the managerial level. We will discuss the research limitations.

5. Implications and research limitations
The proposed model can be used as a basis for future research methods. The findings carry theoretical implications for the decision-making literature, as they extend the scope of the research on management from examining a set of complementary management practices. Managers may recognize the capabilities as enabling valuable organizational capabilities.

Our research points out that the richness and superior value that are generated by the capabilities’ dynamic affect various measures of firm reactivity. This can be an indicator to measure the success of decision-making activities.

This study offers direct implications to practitioners engaged in decision management. The understanding of the correlation between them allows...
organizations to recognize better how to manage their employees effectively and to extend their strategy space with the aim of identifying new managerial practices.

Managers should also plan a training program for their employees to increase their awareness of the importance of the indicators used for enhancing the strategic decision-making process. This can provide the organization with useful information about how to build a strategic decision-making process.

Future research could examine and investigate these areas in more detail. Additionally, it will be useful to investigate the literature including other capabilities, such as organizational and business performance.

This conceptual paper must influence future empirical analysis in order to validate our proposal on the ground. Experimentation and simulation are needed to confirm our proposal in order to identify the exploitable control levers and brakes in detail. In fact, we can identify for such capability several items that can be valued in order to determine the best management practices. This option can be useful to analyze in depth the proposition by testing the model and clarify how to measure the variables.

6. Conclusion
The conceptual model links various organizational capabilities with strategic notions in organizations’ management: decision making. Our approach is considered to be a “hybrid,” because it is made up of different theoretical approaches. Indeed, strategic decision making stands on three pillars that are complementary and interact continuously: collective intelligence (the quality of the intellectual cooperation and collaboration of individuals creating a group’s intelligence), KM (the quality of the knowledge and system) and innovation (the creation of new ideas, products and resource exploitation).

We find in the literature review that the capabilities have a positive association with effective decision making and superior value creation. We attach also a particular attention to the mediating role of IT in term of optimization.

The model we propose will influence future research and managerial practices. Decision makers can exploit the capabilities in order to increase the effectiveness of decision making in a global market’s context.
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