

Information Management Capabilities: Antecedents And Consequences

Completed Research Paper

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Abstract

With organizations immersed in data (Davenport et al., 2012), developing the organizational capabilities to take advantage of this huge flow of heterogeneous data (Bharadwaj et al., 2013) has become essential for creating strategic value. This paper specifically analyzes the antecedents and consequences of IMC - Information Management Capabilities (Carmichael et al., 2010; Mihtas et al., 2011; Phadtare, 2011). To this end, we sought to identify the works that proposed to develop the construct, mapping the theoretical assumptions on which it's founded. We found 98 citations of such works through different types of searches. We selected those publications that contributed or analyzed IMC in some way as a fundamental part of the work. By synthesizing these searches, it was possible to analyze their contributions to IMC and to point out suggestions for future advances on this subject.

Keywords

Information Management Capabilities, Antecedents, Consequences, Literature Review.

Introduction

In recent years, special attention has been paid to the numerous opportunities arising due to the exponential growth of data made available by new technologies. The opportunity for organizations to exploit this data has drawn attention not only from the specialized media (academic and corporate), but also from the mainstream media (e.g. Economist, 2010; New York Times, 2012; Veja, 2013). In addition to being a research topic that is increasingly discussed in academic circles (Pospiech and Felden, 2012), Big Data has also gained prominence among practitioners. The interest of organizations in investing in IT solutions has increased in order to respond to changes in the competitive environment within this Big Data context. According to Gartner (2013), about 64% of the companies invest or plan to invest in specific projects to deal with Big Data opportunities (Computerworld, 2013). The institute also points out that organizations in this context are faced with three challenges: information strategy, data analysis and information management (Gartner, 2013).

Given the importance of this emerging context, this paper seeks to examine the role of information management capabilities (IMC) by reviewing and summarizing the literature of interest for this construct and pointing out directions for future research on subjects. The anchor work on information management capabilities (Mithas et al., 2011) has demonstrated its positive influence, mediated by organizational management capabilities (of customers, processes and performance), on corporate performance. However, with organizations being immersed in data (Davenport et al. 2012), the development of organizational capabilities to take advantage of this huge flow of heterogeneous data (Bharadwaj et al., 2013) has become essential for creating strategic value.

Studies on organizational strategy are the precursors of research on organizational capabilities. Unlike the classical strategic approach, which sees strategy in terms of industry structure and as the search for an advantageous position within it (Porter, 1985), the resource-based perspective focuses on the exploitation of specific firm assets (Teece et al. 1997). In his article "a Resource-Based View of the Firm", Wernerfelt (1984) proposed identifying the firm's resources and, based on their analysis, look at its strategic options. The author started with the "idea of looking at firms as a set of resources goes back to the seminal work of Penrose (1959)" (Wernerfelt, 1984, p. 171). Capabilities, much like assets, can be considered resources of the firm (Wade and Hulland, 2004), and from such a perspective, their idiosyncrasy is responsible for the heterogeneity in organizational performance (Barney, 1991; Rumelt, 1991).

Several organizational capabilities have been studied extensively in the field of Information Systems – IS (e.g. Bharadwaj, 2000; Santhanam and Hartono, 2003; Bhatt and Grover, 2005; Ray et al., 2005). This paper, however, specifically analyzes the antecedents and consequences of IMC (Carmichael et al. 2010; Mithas et al. 2011; Phadtare, 2011) in the field's literature. Considering the research suggestions made by Mithas et al. (2011, p.252) "to investigate the antecedents of information management capability of firms", this paper aims to: (a) identify the studies that proposed a definition of IMC and the theoretical perspectives that underlie it; (b) analyze the follow-up research conducted into earlier studies that have proposed definitions of IMC; and (c) propose a conceptual map showing the relationships of IMC concepts with their theoretical background and the potential constructs for future research into this topic. A search using the Web of Knowledge and Google Scholar tools resulted in 98 citations of such works in different types of searches. We selected those publications that contributed or analyzed IMC in some way as a fundamental part of the work. By synthesizing these searches, it was possible to analyze their contributions to IMC and to point out suggestions for future advances on this subject.

This study is structured as follows: the first part presents the theoretical assumptions on which IMC are based. Then we analyze the major works that sought to develop the construct in terms of the theories and studies on which this development was based. The third part details the procedures for collection and analysis of the data obtained from the citations of the seminal publications. And, finally, we present the results and discuss the possibilities for further research on this construct.

Theoretical Background

Resource and Capabilities

Resources consist of organizational assets and capabilities (Wade and Hulland, 2004). As a result, resources and capabilities are often used interchangeably. Capabilities, however, are specifically composed of the skills to gather, integrate and manage resources (Russo and Fouts, 1997). Or, "capabilities are understood as a procedural ability to direct resources and their interactions in ways that contribute to the advancement of organizational performance" (Taher 2012, p. 158). Capabilities that are valuable, rare, inimitable and non-substitutable can be considered strategic (Teece et al. 1997).

Therefore, the first theoretical assumption on which IMC are based, is related to the strategic role of capabilities in organizations. It states that a firm can distinguish itself within an industry by what strategic resources it controls and how it controls them. The other assumption is that these resources should not be perfectly transferable from one firm to other, which means heterogeneity can be long lasting (Barney, 1991). Barney developed a framework to analyze which of the firm's resources were or were not sources of a sustainable competitive advantage.

Not all resources have the potential to sustain a competitive advantage. To have this potential, a resource must have four attributes (Barney, 1991, p. 105): (a) it must be valuable, in the sense that it exploits opportunities and/or neutralizes threats in a firm's environment, (b) it must be rare among a firm's current and potential competition, (c) it must be imperfectly imitable, and (d) there cannot be strategically equivalent substitutes for this resources that are valuable but neither rare or imperfectly imitable.

These attributes have been widely studied and tested with regard to IS resources (e.g. Mata et al, 1995; Bhatt and Grover, 2005). Barney himself discussed information processing systems and sustainable competitive advantages in his famous work, where he stated what Carr (2003) concluded twelve years later: that the physical IS resources can't be a source of sustainable competitive advantage because they

can be bought, and that a strategy based on these resources is probably imitable. However, the formal and informal management of IS resources is identified as a potential source of sustainable competitive advantage. He argues that the management of information systems may give rise to a rare quality, and, since these are "also a socially complex systems, and thus will probably be imperfectly imitable" (Barney, 1991, p. 114).

Managerial skills are likely to be sources of sustainable competitive advantage since their interrelations are socially complex and, therefore, not subject to low cost imitation (Mata et al. 1995). Seeking to explain the sustainability of competitive advantages based on IT, the authors therefore suggested a framework to analyze four IT attributes (capital requirements, ownership of the technology, technical IT skills and managerial IT skills). To achieve this, their framework followed the conditions for value creation, heterogeneity and immobility of resources. The results led to the conclusion that, among the analyzed IT attributes, only managerial IT skills have the potential to be a source of sustainable competitive advantage. This conclusion corroborates the earlier statements from Barney (1991) about the potential of strategic sustainability of IS. It is the management skill, and not the technology per se, which can be a source of competitive advantage.

In a comprehensive review of the literature on RBV in IS, Wade and Hulland (2004) concluded that this theory was useful for IS research and suggested an extension to it. The authors proposed two temporal phases, which they called the competitive advantage and sustainability phase. In the first phase, the productive use of resources that are valuable, rare and appropriable lead to a short-term competitive advantage, which in the second phase becomes sustainable over time if these resources are poorly imitable, poorly substitutable and hard to transfer. They also discussed another relationship, in which the sustainability phase, in the ex post limits to competition, the low substitutability sustains the value of the resource, an attribute located in the ex ante limits to competition in the competitive advantage phase. The same occurs with low mobility and low imitability, which underpin the scarcity of the resource.

Wade and Hulland (2004) emphasize, however, that resources rarely act alone in creating or sustaining a competitive advantage. IS resources, in particular, work together with other resources of the firm to provide strategic benefits. Therefore, "the strategic information technology (SIT) area of research is a rich source of evidence that can be used to illustrate the importance of the resource complementarity issue" (Wade and Hulland, 2004, p. 123). Complementarity is also evoked by Taher (2012) in his proposed orchestration of resources. Based on a discussion of RBV in the field of IS and analyzing the impacts of IT and non-IT resources on competitive advantage, he proposes the term resource orchestration to explain the result of all resources as a conceptual unit, and also to investigate the impressionability of resources within this orchestration. That is, orchestration, by analogy with the musical term, deals with the complementarity and impressionability of resources in an organization to develop an IT project.

Like in the studies cited above, other extensions and combinations with RBV have been proposed in order to advance our understanding of the role of resources in creating the firm's competitive advantage. Core Competences (Prahalad and Hamel, 1990) can be seen as a more practical approach of RBV, in which the authors argued that, to add value, the firm's resources must be inimitable. Another extension of RBV that will be further discussed below, since it is central to this paper, are the dynamic capabilities (Teece et al. 1997; Eisenhardt and Martin, 2000). This approach goes further than RBV in the sense that it considers that additional attributes must be linked to a skill for it to create a competitive advantage in a dynamic environment.

Dynamic capabilities are a strategic approach to understand organizational change (Hefelt And Peteraf, 2009). But even more, this theoretical perspective deals with the skills of a firm to respond to a changing environment (Teece et al. 1997; Eisenhardt and Martin, 2000; Winter, 2003). The concept of dynamic capabilities is defined in different ways by some authors.

The seminal work in this regard is also the most cited, according to a review of the field conducted by Peteraf et al. (2013): Teece et al. (1997, p. 516) define dynamic capabilities as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments". By contrast, Eisenhardt and Martin (2000, p. 1107) define the concepts as "the processes to integrate, reconfigure, gain and release resources—to match and even create market change". A third definition takes into account the ability of dynamic capabilities of an organization to purposefully create, extend and modify its resource base (Helfat et al. 2007).

In the field of IS, in the eight journals considered by the Senior Scholars Consortium of the AIS - Association for Information Systems - as the top journals in the field (<http://start.aisnet.org/?SeniorScholarBasket>), the first article to use the dynamic capabilities approach in an IS article was the work of Jarvenpaa and Leidner (1998), published in Information Systems Research under the title An information company in Mexico: Extending the Resource-based View of the firm to a Developing country context. The authors presented a case study in which they use dynamic capabilities as an extension of RBV for analysis. After this publication, a growing number of papers is published in the analyzed journals using this theoretical extension (e.g. Tallon and Pinsonneult, 2011; Roberts and Grover, 2012).

RBV will therefore be considered as the theoretical basis for studies on organizational capabilities and its extensions (complementarity, dynamic capabilities and core competencies) and as theoretical specifications by which IMC can be analyzed. Figure 1 illustrates these theoretical perspectives as assumptions for future analysis of the construct.

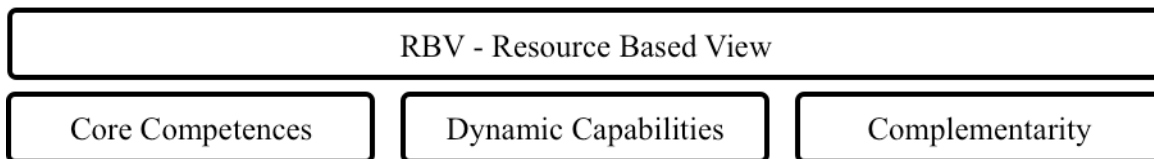


Figure 1. Theoretical Perspectives on Capabilities

Information Management Capabilities

Firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm and that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Barney, 1991, p.101).

Through the lens of the theoretical perspective exposed in the previous section, information as a resource or capability can therefore be considered as potentially strategic. Information as a strategic resource was also highlighted by McGee and Prusak (1994) in their seminal work "Strategic Information Management". In it they point out that an organization should consider all the resources needed to implement its strategy, including information. The authors emphasize four aspects of duality related to information, which make generalizations about its strategic use difficult: (1) information is explicit and abundant, but also appears in subtle ways, (2) creating information is individual and hard, but it spreads and multiplies easily, (3) information has value when it's owned, but only has economic value if it's shared, and, finally, (4) information may have eternal value, but it may also, in certain circumstances, have its value reset to zero very quickly. To deal with these dualities and extract strategic value of information, therefore, the organization needs to develop organizational capabilities to manage them. Focusing on "managing information before turning to technology can be a highly beneficial approach to understanding the strategic dimensions of information" (McGee and Prusak, 1994, p. 8).

Also focusing on information management practices, Marchand and Kettinger (2011) propose five stages of an information life cycle in practice. At each stage there is a continuous evaluation of information. First there is the detection of information, then the gathering of information, organization of information, processing of information and, finally, the maintenance of information. The authors propose a model to evaluate the practical information management measures at companies.

Information management can also be seen as an organizational capability, meaning the ability to use valuable resources in combination (Javenpaa and Leidner, 1998). Managing information means employing a resource in combination with other organizational resources and capabilities to develop tasks described by Marchand and Kettinger (2011).

The information management capability construct, on the other hand, has been proposed in the literature in three papers. Mhitas et al. (2011) coined the term in an article published in *MISQ* to develop a conceptual model linking it with three other organizational capabilities (customer management, process management and performance management). The results showed that these organizational management capabilities mediate the positive influence of the information management capability on the performance

of the firm. The authors developed the term based on a number of selected articles from the IS literature that linked IT-related capabilities and firm performance. For them the concept can be divided into three dimensions when looked at in detail: (a) the ability to provide data and information to users with appropriate levels of accuracy, timeliness, reliability, security and confidentiality, (b) the ability to provide connectivity and universal access at an adequate scope and scale, and (c) the ability to adapt the infrastructure to the emerging needs and directions of the market.

Carmichael et al. (2011) defined IMC as a second-order construct composed of three first-order factors: compilation and production of information, access to information, and identification of information distribution requirements. Their study concluded that IMC have a direct and significant effect on firm performance. Furthermore, IMC contribute to a more competitive strategic position by helping the company achieve competitive advantages in two sources proposed by Porter and Millar (1985): costs and differentiation.

In his book *Strategic Management: Concepts and Cases*, another author, Phadtare (2011), proposes that IMC are linked to five factors: acquisition and retention, processing and synthesis, recovery and use, transmission and dissemination, and support system and integration. The author also suggests in his reasoning about organizational capabilities that IMC belong to the functional capabilities, and not to the organizational capabilities in the value chain from Porter (1985). The Table 1 summarizes the definitions of IMC above and presents their dimensions and the amount of citations found at literature review.

Study	Definition	Dimensions	Impact	Citations
Carmichael et al. (2011)	Organization's ability to understand and use the technological, human and organizational resources needed to manage both internal and external information	(a) compilation and production of information, (b) access to information and (c) identification of information distribution requirements	IMC have a positive and direct impact on organizational performance.	03
Mithas et al. (2011)	The ability to provide data and information to users with appropriate levels (...) and access, and the ability to adapt these levels in response to changes in market needs and directions.	(a) the ability to provide data and information to users with appropriate levels of accuracy, timeliness, reliability, security and confidentiality, (b) the ability to provide connectivity and universal access at an adequate scope and scale, and (c) the ability to adapt the infrastructure to the emerging needs and directions of the market	IMC have an indirect and positive impact on organizational performance.	94
Phadtare (2011)	The ability to coordinate informational resources and put them to productive use	a) acquisition and retention, (b) processing and synthesis, (c) recovery and use, (d) transmission and dissemination, and (e) support system and integration	Not evaluated.	01

Table 1. Definitions of IMC

Procedures for Research and Analysis

We searched scientific databases (e.g. Web of Knowledge, Google Scholar, EBSCO) using the sentence: "information management capability" and its plural form "capabilities". We found three papers that proposed definitions for the concept of IMC as shown in Table 1.

To identify studies that were published after the three publications that developed the IMC concept described above, we used two search tools: Web of Knowledge (<http://apps.webofknowledge.com/>) and Google Scholar (<http://scholar.google.com/>). The searches were performed between October 10, 2013, and October 28, 2013. In total, we found 118 papers referring to the works that proposed the IMC construct. Of these, 19 came from Web of Knowledge and 98 from Google Scholar. Of all citations, 18 were double occurrences between the two portals and one work within the Google Scholar itself. Excluding the duplicate results, the original sample consisted of 98 works.

Most articles were published in journals, totaling 49, followed by 27 conference proceedings, 5 master's theses, and 17 other works (such as ongoing research, books and doctoral theses). All studies were analyzed to see if (a) IMC was a central theme of the work, (b) if a definition of IMC was used, and if so, which one, and (c) if a contribution or advance was made to the IMC literature.

For this analysis the following selection criteria were used:

(a) IMC is a central theme of the article based on the presence of the term in the title, keywords, or as a search variable;

(b) The criteria for the use of the definition was found in the work that brought somewhere in the text at least one of the three definitions of IMC. (Carmichael et al., 2011; Mithas et al., 2011 or Padthare, 2011); and,

(c) The contribution or advance of IMC literature was observed by the presence of new variables relations with the different constructs used in the three papers mentioned before, or new propositions from theoretical reflections.

Following Schäfferling (2013) we considered only those works relevant that conceptualized IMC. Of the initial sample of 98 work, only seven (7%) used some concept for IMC. Of these, only four used IMC as a central concept and proposed some contribution to the literature on the subject. These works all referred to the work by Mithas et al. (2011). The other two had very little citations, as can be seen in Table 1, and none of these referrers employed their IMC concepts.

Even with the small number of studies that used IMC as a central theme, it was possible to perform an analysis of the main directions they took and of the consequences of the definitions proposed by the works of origin. This analysis is presented in the next section.

Findings

When we consider the theoretical antecedents, we can see that the article by Mithas et al. (2011) uses mainly the IT capabilities related to performance, in addition to Baldrige's quality management criteria. The authors based their definition on Marchand's et al (2000) concept of information management practices, and justified their definition based on the information management literature (e.g. Davenport, 1998; Davenport and Linder, 1994). The concept of IMC given by Mithas et al. is therefore not explicitly related to the strategic management literature, or even with theoretical perspectives based on resources. However, their definition of IMC, which mentions "to tailor the infrastructure to emerging business needs and directions" as a criterion (Mithas et al, 2011, p. A4), makes it clear we are dealing with something similar to dynamic capabilities (Teece, 1997; Eisenhardt and Martin, 2000).

The theoretical assumptions of the other two works, on the other hand, tie up the IMC concept closely with strategic theories, and RBV in particular. Carmichael et al. (2011) not only build the theoretical foundations of their studies of organizational capabilities, and information management in particular, on RBV (Barney, 1991), they also include the need for complementarity in the concept description itself. On the other hand, even though it is quite restricted, the IMC concept from Phadtare (2011) implies that IMC belong to another category of organizational capabilities given its differences in comparison to the capabilities of Porter's value chain (1985). This distinction brings their concept closer to the assumptions related to Core Competences (Prahalad and Hamel, 1990).

Among the studies that used IMC as a central theme, or that made some contribution to the literature on this subject, we find the works of Schryen (2012). This author reviewed the literature on IS concerning investments. He made a specific caveat concerning the work by Mithas et al. (2011) by highlighting the empirical evidence of the impact of IMC on mediating organizational capabilities of performance. According to him, the existence of correlations between the constructs does not necessarily imply causality. He also suggested that future research should examine the causal impact of each type of capability on IS capability, in addition to the joint causal effects of all three types of capabilities.

Studying the subject of information management and agility, Huang et al. (2012) proposed a procedural model for how information management helps companies achieve agility with customers. They support the conclusion "that information management capability is indeed a foundational capability that enhances other organizational capabilities, which in turn affect firm performance." (Mithas et al., 2011, p. 251). Their proposed model shows that to achieve agility, organizations must develop information management capabilities by setting up the necessary skills.

Chen and Siao (2013) make a connection between IMC and BI functions. The authors suggest that BI has a crucial influence on capability by enabling the organization to develop the skill of providing data and information to users with the appropriate levels of accuracy, timeliness, reliability, security and confidentiality (Mithas et al. 2011). They further argue that agility is an essential part of management capabilities.

Working on information visibility, Graupner and Mädche (2012) propose a model where IMC play a mediating role between the integrating capability of IT, in complementarity with the process management capability, to impact on the process visibility capability. This model, which is based on RBV, suggests that the process visibility capability can generate a competitive advantage. In addition to directly impacting the visibility capability, they propose that the IMC are directly impacted by the IT integration capabilities. Finally, the authors suggest that there is a direct and mutual impact between the process management and IMC capabilities.

Some similarities between the works that have just been described can be observed. The next section will discuss these convergences, in addition to presenting a synthesis of the theoretical implications of the IMC construct and the possible directions for research on this subject.

Discussion

When we talk about organizational capabilities, it is clear that their theoretical origins lie in the studies on strategic management, specifically those adopting a resource based perspective as a source of differentiation (Wenerfelt, 1984, Prahalad and Hamel, 1990; Barney, 1991; Rumelt, 1991; Teece et al., 1997; Eisenhardt and Martin, 2000). This antecedent was only explicit in the work by Graupner and Mädche (2012), who based their model on RBV and the complementarity of resources.

Graupner and Mädche (2012) also suggest that the information management capabilities, mediated by the process visibility capability, are able to generate competitive advantages. This proposition is consistent with the results of Mata et al. (1995), who found that, among the analyzed IT attributes, only managerial IT skills have the potential to be a source of sustainable competitive advantage.

Both Huang et al. (2012), and Chen and Siao (2011) investigated the relationships between IMC and agility. Agility is closely related to the concept of dynamic capabilities - "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). As we've seen, dynamic capabilities converge with the third dimension of IMC proposed by Mithas et al. (2011): the ability to adapt the infrastructure to the emerging needs and directions of the market.

Figure 2 shows a conceptual map that illustrates the IMC concepts with their dimensions and origins, in addition to the related theoretical perspectives and the consequent contributions.

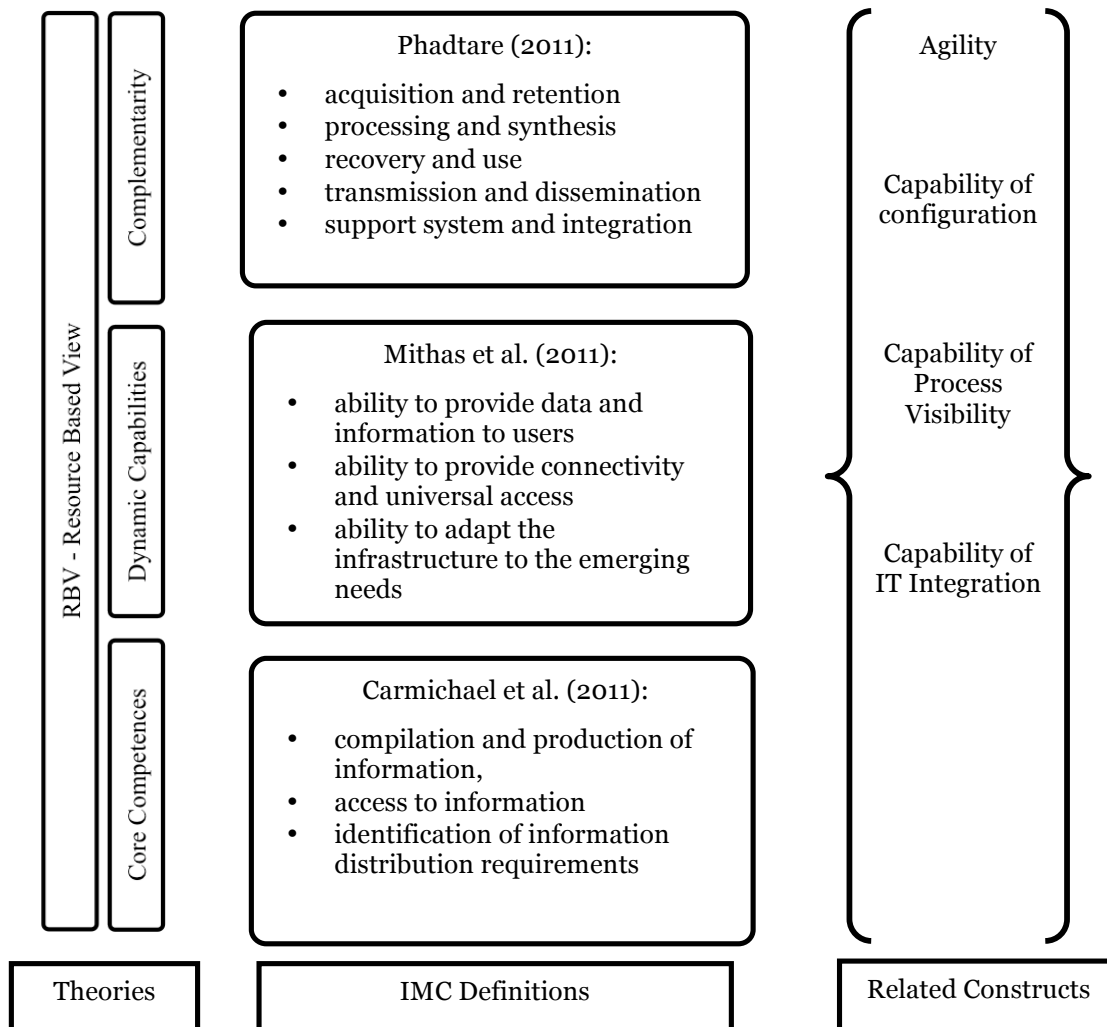


Figure 2. Conceptual Map IMC, theoretical perspectives and consequent contributions

The definitions of IMC and its dimensions according to Phadtare (2011), Mithas et al. (2011), and Carmichael et al. (2011) form the central part of the map. The theoretical perspectives and related theoretical background are presented to the left of the concepts, based on the RBV and relating each of its extensions to a definition of IMC (Core Competences, Dynamic Capabilities, and, Complementarity). On the right side of the map are the related constructs found in the literature for the work that followed IMC, in particular, with reference to the definition of Mithas et al. (2011).

The conceptual map has elaborated from analysis of IMC's theoretical antecedents and from newer works about this construct. It suggests ideas for research in this topic. We point out some potential related constructs to IMC to be studied in the future: integration, competitive advantage, reconfiguration and agility. These four constructs emerged from gaps found by revisiting the theoretical perspectives regarding capabilities and from the identified variables in recent research.

The natural dependent variable of strategic resource studies is competitive differentiation. However, few studies have attempted to analyze its impact (e.g. Carmichael et al, 2011; Graupner and Mädche 2012). There are validated frameworks for the analysis of management capabilities in IS and sustainable competitive advantage (Mata et al., 1995). One of the directions for research in IMC is therefore related to their differentiation potential.

Dynamic capabilities were linked to the search for evidence of the impact of IMC on agility. This approach offers other possibilities of analysis, for example, of integration and reconfiguration (Teece et al. 1997; Eisenhardt and Martin, 2000).

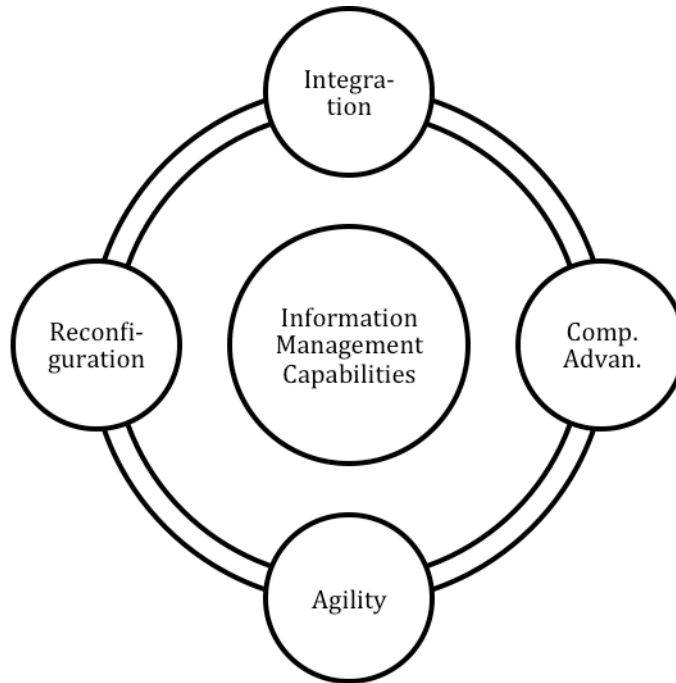


Figure 3. *Possible Investigation of Related Constructs*

Investigating the relationship between IMC and other dimensions may contribute to our understanding of the role of these capabilities in organizations. Finally, considering other theoretical perspectives may bring new contributions to the IMC literature. However, we must be careful with theories that compete with the theoretical assumptions of the construct.

Conclusion

This study aimed to examine the theoretical basis of IMC, to identify the seminal works related to the construct, to evaluate the research arising from them, and to point to new research paths on the subject. Managing information has become even more relevant in the context of Big Data. However, it is to be expected that a new way of managing information will be necessary in the context of Big Data. Although an argument can be made that it is the managerial skills that are still a source of strategic differentiation, as indicated by Mata et al. (1995), it is clear that to acquire these skills in this new context, other skills and abilities are needed. The amount, velocity and variety of data requires that the flow be revised so that organizations can learn to take advantage of Big Data, using information in real time to understand their environment at a granular level, and thus respond to changes as they occur (Davenport et al., 2012).

Responding quickly to market changes is an intrinsic quality of both IMC and dynamic capabilities. As a response to change, IMC plays an important role as a strategic resource. Because of this, three extensions to RBV (Wernerfelt, 1984; Barney, 1991; Rumelt, 1991) were identified that form the theoretical origin of IMC (complementarity, dynamic capabilities and core competencies). The works that proposed to develop the IMC construct (Carmichael et al., 2011; Mithas et al., 2011; Phadtare, 2011) were consistent with these theoretical assumptions. We identified some variables related to IMC's construct by searching their citations in literature. These variables were found in works that performed research using one of three of

IMC's definitions. The contributions of those works that were identified already point to some directions that research can take on this subject.

Considering a context in which organizations are increasingly investing in tools to extract the strategic value of the data in which they are immersed (Davenport et al., 2012), IMC have become a research topic that is even more relevant to IS scholars and practitioners. We discovered that some constructs related to IMC (illustrated in Figure 3) also are claimed in a paper about Big Data. Specifically, we point out agility. This organizational skill was found in some works on the topic (e.g. Demirkan and Delen, 2013; Santaferraro, 2012; Howe, 2008). Exploiting data from new technologies to gain competitive advantage is essential for surviving in an organizational strategic environment (Manyika et al. 2011; McAfee And Brynjolfsson, 2012).

Lastly, IMC may perform a relevant role for agility improvement of a firm, through reconfiguration and integration, to gain competitive advantage in the Big Data context. We suggest that IMC construct could be studied by others for theoretical perspectives and contexts, so we can fully understand its importance for different organizational areas, not only those related to the IS area.

REFERENCES

- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS quarterly*, 169-196.
- Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., and Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, 37(2), 471-482.
- Bhatt, G. D., Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: an empirical study. *Journal of Management Information Systems*, 22(2), 253-277.
- Carmichael, F., Palacios-Marques, D., and Gil-Pechuan, I. (2011). How to create information management capabilities through web 2.0. *The Service Industries Journal*, 31(10), 1613-1625.
- Carr, N. (2003) "IT Doesn't Matter," *Harvard Business Review*, (81)5, pp. 41-49.
- Chen, D. Q., Mocker, M., Preston, D. S., and Teubner, A. (2010). Information systems strategy: reconceptualization, measurement, and implications. *MIS quarterly*, 34(2), 233-259.
- Chen, X., and Siau, K. (2011). Impact of business intelligence and IT infrastructure flexibility on competitive performance: an organizational agility perspective. In *Proceedings of the Thirty Second International Conference on Information Systems*, Paper 23. Shanghai, China.
- Computerworld. (2013). 64% das Organizações com Planos para Big Data.
- Davenport, T. H. (1998). *Conhecimento Empresarial*. Elsevier. Brasil.
- Davenport, T., and Linder, J. (1994, January). Information Management Infrastructure: the new competitive weapon?. In *System Sciences, 1994. Proceedings of the Twenty-Seventh Hawaii International Conference on (Vol. 4, pp. 885-896)*. IEEE.
- Davenport, T. H., Barth, P., and Bean, R. (2012). How 'Big Data' is Different. *MIT Sloan Management Review*, 54(1), 22-24.
- Demirkan, H., Delen, D. (2013). Leveraging the capabilities of service-oriented decision support systems: Putting analytics and big data in cloud. *Decision Support Systems*, 55(1), 412-421.
- Economist. (2010). Data, data everywhere. <http://www.economist.com/node/15557443>.
- Eisenhardt, K. M., and Martin, J. A. (2000). Dynamic capabilities: what are they?. *Strategic management journal*, 21(10-11), 1105-1121.
- Gartner. (2013). Big Data - What information, if you had it, would change the way you run your business? <http://www.gartner.com/technology/topics/big-data.jsp>.
- Graupner, E., and Mädche, A. (2012). Competitive advantage through process visibility-A resource-based Model. *Working Paper Series in Information Systems*, 5.
- Helfat, C., and Peteraf, M. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic organization*, 7(1), 91.
- Howe, D., Costanzo, M., Fey, P., Gojobori, T., Hannick, L., Hide, W., Rhee, S. Y. (2008). Big data: The future of biocuration. *Nature*, 455(7209), 47-50.
- Huang, P. Y., Pan, S. L., and Zuo, M. (2012). Being Responsive to Your Customer: Developing Customer Agility through Information Management. In *Proceedings of the Thirty Third International Conference on Information Systems*, Orlando, USA.

- Jarvenpaa, S. L., and Leidner, D. E. (1998). An information company in Mexico: Extending the resource-based view of the firm to a developing country context. *Information Systems Research*, 9(4), 342-361.
- Kettinger, W. J., and Marchand, D. A. (2011). Information management practices (IMP) from the senior manager's perspective: an investigation of the IMP construct and its measurement. *Information Systems Journal*, 21(5), 385-406.
- Pospiech, M., and Felden, C. (2012). Big data—a state-of-the-art. In *Proceedings of the Eighteenth Americas Conference on Information Systems*, Paper 22, Seattle, Washington.
- McAfee, A., Brynjolfsson, E. (2012). Big data: the management revolution. *Harvard business review*, 90(10), 60-68.
- McGee, J. V., and Prusak, L. (1994). *Gerenciamento estratégico da informação*. Elsevier.
- Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., Byers, A. H. (2011). Big data: The next frontier for innovation, competition, and productivity.
- Mata, F. J., Fuerst, W. L., and Barney, J. B. (1995). Information technology and sustained competitive advantage: a resource-based analysis. *MIS quarterly*, 487-505.
- Mithas, S., Ramasubbu, N., and Sambamurthy, V. (2011). How information management capability influences firm performance. *MIS quarterly*, 35(1), 237-256.
- New York Times. (2012). The Age of Big Data. http://www.nytimes.com/2012/02/12/sunday-review/big-datas-impact-in-the-world.html?_r=1&ndscp=1&ndsqr=1&ndsqt=Big%20Data&st=cse.
- Phadtare, M. T. (2011). *Strategic Management: Concepts and Cases*. PHI Learning Pvt. Ltd.
- Porter, M. (2004). *Estrategia competitiva*. Elsevier Brasil.
- Porter, M. E., and Millar, V. E. (1985). "How information gives you competitive advantage", *Harvard Business Review*, 63(4), pp. 149-175.
- Prahalad, C.K. and Hamel, Gary (1990). "The Core Competence of the Corporation." *Harvard Business Review* 68(3): 79-91.
- Ray, G., Muhanna, W. A., and Barney, J. B. (2005). Information technology and the performance of the customer service process: A resource-based analysis. *Mis Quarterly*, 625-652.
- Roberts, N., and Grover, V. (2012). Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. *Journal of Management Information Systems*, 28(4), 231-270.
- Rumelt, R. P. (1991). How much does industry matter?. *Strategic management journal*, 12(3), 167-185.
- Russo, M. V., and Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of management Journal*, 40(3), 534-559.
- Santaferarro, J. Filling the Demand for Data Scientists: A Five-Point Plan. *Business Intelligence Journal*, 18(4).
- Santhanam, R., and Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS quarterly*, 125-153.
- Schäfferling, A., and Wagner, H. T. (2013). Do Investors Recognize Information Technology As A Strategic Asset? A Longitudinal Analysis Of Changes In Ownership Structure And IT Capability. In *Proceedings of the 21st European Conference on Information Systems, Completed Research*, Paper 30, Utrecht, Netherlands.
- Schryen, G. (2012). Revisiting IS business value research: what we already know, what we still need to know, and how we can get there. *European Journal of Information Systems*, 22(2), 139-169.
- Taher, M. (2012) Resource-Based View Theory. In: *Information Systems Theory*. Springer New York, p. 151-163.
- Tallon, P. P., and Pinsonneault, A. (2011). Competing perspectives on the link between strategic information technology alignment and organizational agility: Insights from a mediation model. *Mis Quarterly*, 35(2), 463-484.
- Teece, D. J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533.
- Veja. (2013, 15 may) Entenda o que é Big Data. *Veja*. V (2321). p.
- Wade, M., and Hulland, J. (2004). Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS quarterly*, 28(1), 107-142.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, 5(2), 171-180.
- Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic management journal*, 24(10), 991-995.