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A bottom-up path for IT management success: From infrastructure quality to competitive excellence

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ABSTRACT

Can an information technology (IT) infrastructure contribute to competitive advantage and firm performance, even if this infrastructure follows IT standards and best practices, and is then neither rare nor inimitable as a resource? This study leverages the dynamic capability view and the underpinning evolutionary theories of routines, learning, and cooperation to develop a model analyzing and explaining the bottom-up path from the quality of IT infrastructure to the competitive excellence of the firm in medium-to-fast-paced business environments. This three-step causal path links the following constructs: (1) IT infrastructure quality (ITIQ); (2) business–IT partnership (BITP); (3) strategic contribution of IT (ITSC), and (4) firm's competitive excellence (CE). The study tests this model through a survey questionnaire to 212 Italian managers.

1. Introduction

Information systems and information technology (IT) scholars and practitioners often refer to the composite of hardware, software, and connectivity of an organizational system as its IT infrastructure. Both scholars and practitioners evaluate the quality of IT infrastructure through technical and efficiency measures, which include, for example, its robustness, reliability, usability, compatibility, integration, scalability, and modularity (Bhatt, Emdad, Roberts, & Grover, 2010).

Does a high-quality IT infrastructure play a strategic role in organizations? This question gives rise to a lively, long debate. Today, many scholars agree that the IT infrastructure plays a strategic role and indirectly influences firm performance, but the process through which this influence unfolds is not completely clear (Kohli & Grover, 2008).

The nature of mainstream theories that scholars traditionally use to address IT management issues may contribute to this gap in understanding. Most scholars investigating information systems and information management topics build upon the resource-based view (RBV) of the firm (Wade & Hulland, 2004) and/or the literature on business–IT alignment (Luftman, 2000). Although the RBV and the alignment approach suitably explain the top-down path from competitive strategic moves to IT management and, consequently, IT infrastructure, these theories do not provide effective tools to understand the possible feedback effects and bottom-up paths, leading from a high-quality IT infrastructure to strategic contribution of IT and competitive excellence.

The RBV assumes that a firm's success depends on the firm's control over valuable, rare, and inimitable resources, because only this control would allow the firm to build and maintain a sustainable competitive advantage. This view often leads scholars to assume that an IT infrastructure may only play a strategic role when representing a rare and inimitable resource—that is, only when the IT infrastructure is highly idiosyncratic and very specific to the firm (Santhanam & Artono, 2003). In contrast, today's IT infrastructures often consist of standard solutions and thus are easily imitable, mainly because of the booming phenomena of IT outsourcing and cloud computing. Many components of IT infrastructures are, indeed, commodities. Therefore, the classical RBV has difficulties in explaining the potential strategic value of these IT infrastructures.

In many cases, also the literature on dynamic capabilities (Teece, Pisano, & Shuen, 1997) views the firm through the RBV strategic lens (Lin & Wu, 2014). According to the authors who follow this logic, organizational capabilities, and particularly the capability to change and adapt operational routines, should aim at the only strategic goal, which consists of transforming valuable, rare, inimitable, and non-substitutable (VRIN) resources into competitive advantage (Cepeda & Vera, 2007). In this view, dynamic capabilities are factors that investments must leverage to achieve competitive advantage. Conversely, the efficiency with which IT infrastructures enable operational routines is unlikely to draw the attention of these scholars.

The literature on business–IT alignment tends to follow a top-down logic similar to that which the RBV adopts. Alignment studies usually

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posit that a good fit between IT infrastructure and business needs derives from explicit planning and coordination at the top management level, for example, between the CEO and the CIO (Karahanna & Preston, 2013). In this view, scholars devote great attention to the CIO's characteristics (Li & Tan, 2013); change and innovation mainly result from strategic design, and effective operational alignment is a hierarchical consequence of strategic alignment.

Although these approaches provide valuable contributions to understanding IT management value, they do not explain the social mechanisms allowing improvisation, ad-hoc problem solving, and bottom-up and/or emergent innovation, which increasingly appear as the sole strategies underlying the survival of firms in turbulent markets (Sambamurthy, Bharadwaj, & Grover, 2003). Therefore, the alignment approach to IT, the RBV, and the literature on dynamic capabilities under the RBV may fail to explain how (IT-supported) competition really occurs in fast-paced business environments (Barreto, 2010).

For these reasons, this study adopts an evolutionary perspective rather than the RBV or alignment approach to examine the strategic role of IT infrastructure quality in today's turbulent business scenario. This study builds upon the seminal work of Sambamurthy et al. (2003), which analyzes organizational evolution following Schumpeter's adaptive dynamics (Schumpeter, 1934). According to the Schumpeterian theory of disequilibrium and market disruption, fast-paced environments rapidly erode any competitive advantage. Predicting how the next wave of key competitive advantages will look like in the future is often impossible. Therefore, superior performance may stem only from continuous innovation and strategic moves disrupting the equilibria. The disruption of old equilibria generates options (Amram & Kulatilaka, 1999) that may provide a dramatic, although temporary, competitive advantage if firms exercise them timely. This strategy requires a coevolutionary attitude, because effective and systematic option seizing, development, and selection can only occur through a wide, diverse, and dynamic web of collaborative links, both within and across organizations (Eisenhardt, 2000).

Sambamurthy et al. (2003) define this logic as the logic of opportunity, opposing to the logic of leverage typical of the RBV. The logic of opportunity focuses on evolutionary learning processes and therefore provides an interesting alternative approach to dynamic capabilities, by highlighting the importance of aspects that the mainstream logic of leverage overlooks. Under the Schumpeterian (Schumpeter, 1934) conditions of creative destruction and coevolutionary learning, second-level routines cannot deterministically predict and control all the possible changes in first-level (i.e. operational) routines that the firm may need one day. Therefore, existing routines must (1) enhance exploration, sensing, and alertness, thus allowing a firm to be quickly aware of emerging threats and opportunities; (2) allow or facilitate the rapid seizing of opportunities; (3) allow rapid unlearning, knowledge, and process recombination, trial-and-error, and improvisation; and (4) support cooperation (Eisenhardt, 2000; Teece et al., 1997).

The above perspective supports the idea that the IT infrastructure may play a crucial role in the pursuit of competitive excellence. Any typical high-quality IT infrastructure today is scalable, modular, and fully compatible with web standards, and therefore has the potential to strongly support the four goals appearing above (Sambamurthy et al., 2003).

Despite the explanatory power of the evolutionary vision, the information systems literature has yet to explore its potential, with few models leveraging a Schumpeterian (Schumpeter, 1934) view of routines to explain the bottom-up path from IT infrastructure quality to competitive excellence.

This study draws on the evolutionary theories of learning and cooperation and on the model of Zollo and Winter (2002), which identifies three steps in the successful knowledge-based evolution of a firm: experience accumulation, knowledge articulation, and knowledge codification.

Using these elements, this study develops a model that predicts a three-step bottom-up path from IT infrastructure quality to competitive excellence in turbulent business environments. This three-step causal path links the following constructs: (1) IT infrastructure quality (ITIQ); (2) business–IT partnership (BITP); (3) strategic contribution of IT (ITSC); and (4) firm's competitive excellence (CE).

Through a survey questionnaire involving 212 managers in northern Italy, the study tests this model. The analysis confirms that BITP fully mediates a positive relationship between ITIQ and ITSC and that ITSC fully mediates the positive relationship between BITP and CE.

This study proposes an alternative way of looking at information systems management. As today's IT infrastructures are often modular, scalable, web compatible, and standardized, sometimes scholars consider them commodities: neither rare nor inimitable and then of little, if any, strategic importance. On the contrary, the outcomes of this study suggest that the modularity, compatibility, and standardization of an efficient IT infrastructure may be key to strategic success in turbulent environments.

2. Theoretical background and hypotheses

Recent interdisciplinary research streams in evolutionary studies explore how cultural and intangible entities, such as beliefs, practices, capabilities, relationships, technologies, and institutions, coevolve in changing and challenging environments (Nelson & Winter, 2002). These cultural and intangible factors, while evolving, shape organizational life through complex, non-linear paths, where feedback effects play an important role (Nelson & Winter, 2002). New evolutionary models are starting to replace the traditional, linear model of evolution, which focuses on the key mechanisms of variation, selection, and retention (Cepeda & Vera, 2007). Along with variation/change, competitive selection, and retention/inertia, also learning (Lorenz, 1973) and cooperation (Fehr & Schmidt, 1999) nowadays authoritatively appear as basic mechanisms of evolution. The mechanisms of learning and cooperation are perhaps the most interesting conceptual tools complementing the classical Darwinian concepts.

The conceptual model that this study presents herein builds upon studies of cooperation and learning. More specifically, the model focuses on the role of routines (Zollo & Winter, 2002) in turbulent environments, in which the logic of opportunity tends to supersede the logic of leverage (Sambamurthy et al., 2003).

2.1. The role of routines in evolutionary theories of learning

In the evolutionary view, existing routines, which embed previously successful knowledge, both constrain and enable knowledge processes. At the organizational level of analysis, the pre-existing knowledge base includes a complex body of routines. This complex body of routines is hard-wired in the organization through culture, reward/sanction systems, social bonds, and/or technological artifacts. These routines shape interactions and result in consequences, which, in turn, facilitate or hinder further learning (Ricciardi, 2011).

Learning processes, as evolutionary studies describe, embody paradoxical tensions, with even the most creative learning activities, such as innovative trial-and-error, tending to result in rigidities—for example, in the form of new prejudices. Strong mechanisms, such as habituation, conformism, and proceduralization, explain these phenomena (Ricciardi, 2011).

Therefore, from an evolutionary standpoint, the key strategic goal is to re-activate cyclically the capability to question existing routines and to generate new ones. The organizations that achieve a competitive advantage are those that prove themselves capable of re-activating a learning process at a time and in a way that generates the best options to address emerging threats and opportunities. As future opportunities and threats are often unpredictable, especially in fast-paced environments, the organizations that create the conditions for sustainable continuous innovation and learning are the most likely to find themselves capable of change when change becomes suddenly advantageous.

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