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Competitive Advantage of Operational and Dynamic Information Technology Capabilities

by

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Abstract

Based on contradictory findings reported by researchers into the payoffs of information technology (IT) investments, a key question for information system researchers and practitioners concerns what role IT may play in enhancing competitive advantage. In this study, IT is conceptualized as a capability, and a differentiation is made between the routine use of IT as operational IT capability and the purposeful use of IT to achieve change, that is, dynamic IT capability, in order to analyze and describe the direct effect of IT capabilities on competitive advantage. The research design will be a cross-sectional survey, using structural equation modeling (SEM), and the empirical analysis will take as its population the financial and industrial firms of Lima, Peru.

Keywords: information technology, operational and dynamic capabilities, marketing strategies, structural equation modeling (SEM).

CHAPTER 1: INTRODUCTION

In the contemporary information era, one of the key factors in the search for higher levels of competitiveness is information technology (IT) (Bharadwaj, Bharadwaj, & Konsynki, 1999; Weill, Subramani, & Broadbent, 2002). IT is defined as the firm's total investment, expenditure, and know-how in computing and communication technology, including hardware, software, processes, and people dedicated to providing these services (Weill & Broadbent, 1998). IT affects the management system and the organizational structure by changing the methods and capability of its users to search, capture, store, and transfer information (Sambamurthy, Bharadwaj, & Grover, 2003). Because of these major changes, IT can be viewed as a critical source of firm-renewal capabilities in intra- and inter-firm relationships (Kim & Mahoney, 2006; Kumar, 2004; Sambamurthy, Bharadwaj, & Grover, 2003). The importance of IT is reflected in huge IT investments that have been made around the world (Irani & Love, 2002; Jeffery & Leliveld, 2004; Peffers & Searinen, 2002; Ross & Beath, 2001). The International Data Corporation estimated an IT investment of US$ 1.0 trillion in 2007 and projected US$ 1.5 trillion in 2010 (IDC, 2007). With these amounts of investments involved, a key question is what role IT can play in enhancing competitive advantage. In this context, I, the researcher in the proposed study, will try to describe the relationships between IT capabilities and competitive advantage, using the conceptualization of IT capabilities as a higher order construct.

Background of the Problem

The examination of the organizational impact of IT has been under debate for a number of years (Devaraj & Kholi, 2003; Hitt & Brynjolfsson, 1996; Mellville, Kraemer, & Gurbaxani, 2004). While some authors have attributed large productivity improvements and substantial consumer benefits to IT, others reported that IT has not had any bottom-line impact on business profitability (Brynjolfsson, 1993; Hitt & Brynjolfsson, 1996). This contradiction emerges when IT investments are directly considered as one of the main value components of competitive advantage, although many researchers have shown that these investments can be acquired elsewhere, by copying or imitating and substituting them (Bharadwaj, 2000; Wade & Hulland, 2004). For example, IT capabilities were found to be an important differentiator of banks that were doing well in the mid-1980s, compared to those that were less profitable (Nolan, 1994). Widely publicized IT programs in firms such as American Airlines, Merrill-Lynch, and Frito-Lay have been associated with superior business performance. Devaraj and Kholi (2003) presented empirical evidence of improved financial performance of organizations in the health-care industry as a result of IT investments. At the same time, there is also evidence that many firms concerned about falling behind on the technology curve engage in high IT investment without deriving any benefits from it (Nolan, 1994).

Researchers have developed more sophisticated econometric models to analyze the relationship between IT investments and a firm or country's productivity (Dewan & Kraemer, 1998, 2000; Melville, 2001). Hitt and Brynjolfsson (1996) argued that IT investments may produce productivity benefits, but these productivity benefits need not translate into improved firm profitability. IT investments may increase consumer surplus while not improving firm profitability. The research in this area has also yielded contradictory results, and the findings have been ambiguous (Devaraj & Kholi, 2003; Kemerer & Sosa, 1991).

The increased interest in developing and operating an IT infrastructure is due to the need to have better understanding of the complementary IT capability requirements for operative efficiency and product effectiveness (Evans, 2002; Zhu, Kraemer, Xu, & Dedrick, 2004). In response to these needs, several researchers (Bakos & Treacy, 1986; Bharadwaj, Bharadwaj, & Konsynski, 1999; Brynjolfsson & Hitt, 1996, 2000, 2003; Scott-Morton, 1991) have studied the impact of IT at different levels of the organization. The most significant perspective of previous research has been grounded in the microeconomic theory and business strategy, with frameworks of theory of production for IT business value productivity, theory of competitive strategy for IT business profitability, and theory of consumer for IT consumer value (Brynjolfsson & Hitt, 1996). This study will be based on the theory of competitive strategy.

One of the first works using the theory of competitive strategy for IT business profitability came from Venkatraman (1991). The basic assumption of this study was that the business environment was and would remain turbulent and IT would continue its rapid evolution at least over the next decade, that is, into the 2000s. Broadbent, Weill, and Clair (1999) explored the link between firm-wide IT infrastructure and business processes change. The finding was that all firms needed a basic level of IT infrastructure capability to implement business process reengineering (BPR). Bharadwaj (2000), taking the resource-based view, developed the concept of IT as an organizational capability and empirically examined the direct association between IT capability and firm performance. Results indicated that firms with high IT capability tended to outperform firms with low IT capability on a variety of profit- and cost-based performance measures. Another meaningful study in this area is from Melville, Kraemer, and Gurbaxani (2004), who, based on the competitive theory and on the resource-based view (Barney, 1991; Peteraf & Barney, 2003; Wade & Hulland, 2004; Wernerfelt, 1984) tried to integrate the IT business-value tendency in research into a unique conceptual framework drawn from the business processes perspective. Their principal finding was that the IT effect can be estimated, but the estimated dimensions depend on internal and external factors. Pavlou (2006), taking the dynamic capability view (Teece, Pisano, & Shuen, 1997), described how IT can be strategically used as a source of sustainable competitive advantage in rapidly changing environments. They posited that IT competence influences competitive advantage through the key mediating variable of resource reconfigurability. Results of their research indicated that IT does not have a direct impact on performance but has an indirect impact through a set of other factors. Thus, the effective use of IT can have differential performance outcomes, especially if directly applied to the development of dynamic capabilities (Pavlou & El Sawy, 2006).

According to these findings, and sometimes attributing the inconclusiveness to conceptual limitation, several authors have stressed the need for better theoretical models that trace the path from IT investment to business value (Beath, Goodhue, & Ross, 1994; Pavlou, 2004).

Statement of the Problem

IT is a key strategic resource for competitive advantage, which is reflected in the considerable amount of money being invested by organizations -around US$1.0 trillion in 2007 (IDC, 2007)-. However, due to the contradictory findings concerning the payoffs of these IT investments (Brynjolfsson & Hitt, 1996, 2003; Devaraj & Kholi, 2003; Orlikowski & Iacono, 2001), evaluating the effectiveness of IT has became a critical issue (Kanungo, Duda, & Srinivas 1999, Pavlou & El Sawy, 2006; Sethi & King, 1994) since IT is not only a

potential enabler of change but also a potential constraint or inhibitor (Broadbent, Weill, & Clair, 1999). In this area, a key question raised by IT system researchers and practitioners is how IT can build a competitive advantage (Sambamurthy, Bharadwaj, & Grover, 2003). Some have suggested that IT capabilities enhance competitive advantage (Barua, Kriebel, & Mukhopadhyay, 1995; Beath, Goodhue, & Ross, 1994; Bharadwaj, 2000; Overby, Bharadwaj, & Sambamurthy, 2006); however, a more detailed evaluation is needed to gain a better comprehension of how IT is related to competitive advantage (Pavlou & El Sawy, 2006). Pavlou and El Sawy (2006) claimed that the capability dimension is a higher order construct. As Pavlou (2004) emphasized, the increase in environmental turbulence has made dynamic IT strategy more challenging, and this critical topic still remains relatively under-researched (Wade & Hulland, 2004). Even though the link between IT and competitive advantage has been extensively examined (Bharadwaj, 2000; Pavlou & El Sawy, 2006; Sambamurthy et al., 2003), Pavlou (2004) pointed out that there is still lively debate about the strategic role of IT, which may intensify in turbulent environments (Jeffery & Leliveld, 2004; Peffers & Searinen, 2002; Ross & Beath, 2001).

Purpose of the Study

The purpose of this study is to test if the operational and dynamic IT capabilities are second-order superordinate constructs, to evaluate the relationships between operational IT capabilities and dynamic IT capabilities, to employ a resource-based perspective of IT to develop theoretical links, and to empirically examine the association between IT capabilities and a firm's competitive advantage and to explain whether the relationship between operational IT capabilities and competitive advantage is mediated by dynamic IT capability.

For the purpose of this study, the empirical analysis will be carried out in the financial, industrial and service sectors of Lima, Peru.

Significance of the Problem

A new strategic IT role in an enterprise becomes of critical importance because it enables business organizations, such as computing, communication, and content industries, to cope with the convergence of different kinds of IT and to grasp unparalleled business opportunities by redefining the nature of customer relationships, products and services, business partnerships, and economic markets (Sambamurthy & Zmud, 2000). Simultaneously with this convergence in both technologies and product markets, many, if not most, economic markets have become global and hypercompetitive (D'Aveni, 1994), disrupting established recipes of competition and business conduct (Venkatraman & Henderson, 1998). To achieve business success will demand that contemporary firms creatively and quickly combine IT assets with a deep pool of business knowledge and competencies, fine-tuned business processes, and a rich network of business relationships (Sambamurthy, 2000; Sambamurthy & Zmud, 2000). For IT value innovation to occur a simultaneously tight and adaptive coupling must exist between firms' IT and business activities to enhance process efficiency and product effectiveness. An enterprise-wide new strategic IT role design becomes of critical importance because it enables such organizational arrangements.

Methodology of the Study

The research method will be quantitative and descriptive-explanatory, and the logic will be deductive. The research design will be a cross-sectional survey, with primary and secondary data sources, these being from outcomes-based research, using Lima, Peru's financial and industrial sectors for the empirical study.

IT will be taken as an organizational capability (Bharadwaj, 2000) and its effect on competitive advantage assessed, distinguishing operational IT capabilities from dynamic IT capability (Zollo & Winter, 2002) and integrating IT resources and business activities (Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, et al., 2007; Sethi & King, 1994). The population for empirical analysis will be the financial, industrial and service firms from Lima, Peru with a minimum of US$1 million in sales. The unit of analysis will be the firm, and the senior professional and graduate students from Centrum-Católica, who are in the IT field in industry, will be the persons interviewed. The minimum sample size will be around 200 (Kline, 2005). The questionnaires will be adapted from other research studies. The data will be collected in each classroom, and the execution of the survey will be managed by the researcher of this study. The data will be checked for consistency and validity.

The data analysis for metric quantitative variables will start characterizing the shape of their distribution, after testing for linearity and normality. A structural equation modeling (SEM) will be used since this technique permits complicated variable relationships. The SEM model will be analyzed and interpreted sequentially in two stages: (a) the assessment of the construct validity and reliability of the measurement model, followed by (b) the assessment of the structural model. Construct validity (convergent and discriminate validity) to measure stability across methodologies will be analyzed using exploratory factor analysis (EFA). To measure stability across the units of observations, the reliability of the multi-item scale will be examined, using confirmatory factor analysis (CFA). The hypotheses will be tested using SEM since the main objective of this technique is theory testing in the form of structural relationships (Shah & Goldstein, 2006).

Research Questions

The evaluation of the role and effectiveness of IT has become a critical issue due to the contradictory findings concerning the payoffs of IT investments (Brynjolfsson & Hitt, 1996, 2003; Devaraj & Kholi, 2003; Orlikowski & Iacono, 2001). The key question raised in this field is how IT can build a competitive advantage (Sambamurthy, Bharadwaj, & Grover, 2003). To disentangle the contradictory findings of previous research, IT is conceptualized as operational IT capability and dynamic IT capability and their influence on competitive advantage will be assessed on the basis of a resource-based view and on dynamic capability.

Application of resource-based view theory reveals that the differences between firms are the results of the resource heterogeneity they have and their ability to create internal competencies difficult to imitate (Barney, 1991). These competencies come from the resources, their deployment, and the leverage they have. Wade and Hulland (2004) defined IT resources as assets and organizational competencies. IT competencies are defined as a firm's knowledge, skill, and experience (Prahalad & Hamel, 1990), while IT capabilities are defined as the ability of the firm to perform a particular task or activity using IT resources (tangible and intangible). These IT assets, per se, do not add value by themselves. Instead, it is due to the usage that is given in its value chain to grasp market opportunities that affects a firm's competitive advantage (Mooney, Gurbaxani, & Kraemer, 2001; Porter, 1996; Weill & Aral, 2005). Depending on the type of usage, IT capability is conceptualized as operational, or day-to-day IT capability, and dynamic, or to cope with changing IT capability. It is the combination of resources, their deployment, and their leverage that makes IT capabilities enhance sustainable competitive advantage. Pavlou and El Sawy (2006) claimed that the capability dimension is a higher order construct. These points lead to the following research questions:

R1: Are the IT capability dimensions higher order constructs?
R2: Is there a relationship between IT capabilities and competitive advantages?

Hypotheses

The information technology capability is the firm's ability to purposefully mobilize and assign IT resources and IT organizational competencies towards the market (Bharadwaj, 2000, Wade & Hulland, 2004). Saini and Johnson (2005) pointed out that according to this resource-based perspective, and the market theory, IT is a group of engineering tools that facilitate market entry through operational and dynamic capabilities. An operational IT capability is an instrumental amplification of IT transaction effectiveness (Saini & Johnson, 2005). Operational IT capabilities are particularly important in exploiting demand since they allow the individualization of the mass-products and services. Operational IT capabilities support routine business activities (Helfat et al., 2007) and have more influence on process efficiency than on product effectiveness. Bharadwaj, Sambamurthy, and Zmud (2001) argued that operational capability does not have a direct relationship with competitive advantage. In a research study, Sethi and King (1994) tested whether operational IT capability is a general factor for a multidimensional measure or index of competitive advantage. On the other hand, the IT capabilities oriented towards new market opportunities, that is, dynamic capabilities, are those organizational capabilities that support the development of new and ongoing products (DeSarbo, DiBenedetto, Song, & Sinha, 2005). Because of investment path dependency, an interaction exists between operational IT capabilities and dynamic IT capabilities (Helfat et al., 2007; Winter, 2003) In addition, Pavlou and El Sawy (2006) proposed that dynamic IT capability is a second-order construct. The above observations led to the following hypotheses:

$H_0$1: The operational IT capability is not a higher order construct
$H_1$1: The operational IT capability is a higher order construct.
$H_0$2: The dynamic IT capability is not a higher order construct.
$H_1$2: The dynamic IT capability is a higher order construct.
$H_0$3: A direct relationship exists between operational IT capability and competitive advantage.
$H_1$3: No direct relationship exists between operational IT capability and competitive advantage.
$H_0$4: No interrelationship exists between operational IT capability and dynamic IT capability.
$H_1$4: An interrelationship exists between operational IT capability and dynamic IT capability.

Dynamic IT capabilities support the sensing of customers' needs as well as the support of learning, coordinating, and integrating the action to cope with change (Pavlou, 2006, Pavlou & El Sawy, 2006). They, thus, have more influence on product effectiveness than on process efficiency and so have an effect on competitive advantage (Pavlou, 2006). As time passes, these dynamic IT capabilities form part of the operational IT capability (Teece et al., 1997). The above observations led to the following hypotheses:

$H_0$5: Dynamic IT capability does not mediate the relationship between operational IT capability and competitive advantage.
$H_1$5: Dynamic IT capability does mediate the relationship between operational IT capability and competitive advantage.

Theoretical Framework

Three distinct, but increasingly converging, streams of literature frame the proposed conceptualization of this study. First, the literature on strategic management offers insights into the resources, capabilities, and processes shaping firms' competitive conduct (Porter, 1996; Sambamurthy, Bharadwaj, & Grover, 2003). Second, IT literature offers insights into the effect of IT on performance (Hitt & Brynjolfson, 1996). Third, the literature entrepreneurship offers insights into the behaviors of the innovators, in which a firm recognizes, exploits, and explores market opportunities through novelty in resources, customers, markets, or combinations of resources, customers, and markets (Smith & DeGregorio, 2001). These three streams established the theoretical frame of this study, in which I will propose that operational and dynamic IT capabilities are related, and that these capabilities affect a firm's competitive advantage in different ways.

A potential framework for augmenting the conceptual analysis of the effect of dynamic capabilities on competitive advantage is the resource-based view, described in the literature on management strategy (Barney, 1991; Eisenhardt & Martin, 2000; Helfat et al., 2007; Teece et al., 1997; Peteraf & Barney, 2003; Zollo & Winter, 2002; Wang & Ahmed, 2007; Wernerfelt, 1984). The authors of resource-based theory posited that the sources of firm heterogeneity underlie competitive advantage because of the unique combination of resources that are scarce, valuable, and difficult to imitate (Helfat & Raubitschek, 2000; Rumelt et al., 1994). Such advantage can be sustained over longer time periods as long as the firm is able to protect against resource imitation, transfer, or substitution (Wade & Hulland, 2004).

The resources of an organization include tangibles, intangibles, and human assets (or resources) which the organization owns, controls, or has access to on a preferential basis (Helfat et al., 2007). An organization need not own a resource for it to comprise part of private or public resource. The use of a resource is considered to be a capability, which means that resources are something that the organization can draw upon to accomplish its aims (Helfat et al., 2007). A capability is the ability to perform a particular task or activity using the available resources of the firm.

Firms searching for superior performance use two different mechanisms, acquiring resources and building capabilities (Makadok, 2001). The resource acquisition creates economic value when the knowledge and information applied by the firm has lower costs than the marginal productivity (Barney, 1986). In contrast, building capabilities refers to the firm's ability to integrate, build, and reshape internal and external resources for creating high-order capacities that are intertwined in the social, structural, and cultural context (Teece et al., 1997). This last characteristic of the capabilities is what makes them comparatively more difficult to imitate and gives them higher value (Eisenhardt & Martín, 2000). While resources serve as the basic unit of analysis for assessing success, a firm creates competitive advantages by assembling and reconfiguring resources that work together to create organizational capabilities (Bharadwaj, 2000, Teece et al., 1997). Capabilities are put into use through managerial and organizational processes (Helfat et al., 2007). Capabilities subsume the notion of organizational competencies (Prahalad & Hamel, 1990), either for operational activities or for sensing, learning, coordinating, and integrating activities (Pavlou & El Sawy, 2006), and are rooted in processes, patterned organizational behavior, and business routines (Helfat et al., 2007).

The mechanism by which dynamic capabilities shape performance is still not well understood (Zott, 2003). Similar to the criticism leveled at the resource-based view (Priem & Butler, 2001, as cited in Wade & Hulland, 2004), criticism of the tendency to link dynamic capability tautologically to performance has been voiced (Williamson, 1999). Despite numerous studies, the strategic impact of dynamic capabilities is still under debate (Grant, 1999; Williamson, 1999). One source of this debate is its abstract concepts are not amenable to managerial action. However, the goal of dynamic capabilities has been touted as a formidable achievement for management (Grant, 1999; Pavlou & El Sawy, 2006). Pavlou and El Sawy (2006) insisted that dynamic capability analysis is an abstract high-level phenomenon that prevented the conceptualization, operationalization, and measurement of concrete processes and components of this capability.

The authors of literature on information technology have posited that the primary value from IT emerges through the association and integration of business strategies, design, structure, and organizational competencies (Barua & Mukhopadyay, 2000). Sambamurthy, Bharadwaj, and Grover (2003) claimed that IT business value is tangible when the marginal cost of producing digital products and services rapidly approaches zero, going down successively as new generations of technologies become available. Thus, the coordinated cost becomes extremely low, allowing not only the search for and comparison of products and services, but also the combination of digital products and services to create new value (Malone, Yates, & Benjamin, 1987). Firms are integrating IT into processes, knowledge, and relationships to encourage innovation in customer relationships, providers, supply chains, distribution, commercial channels, and other key activities (Agarwal & Sambamurthy, 2002; Barua & Mukhopadhyay, 2000; Sambamurthy et al., 2003).

Writers of literature on entrepreneurship have maintained that dynamic, market-based economies are deemed successful when competitive processes result in (a) a greater sensitivity to differences in consumers' needs, wants, tastes, and preferences, (b) higher quality

goods and services, (c) greater innovativeness, (d) higher productivity, and (e) greater economic growth (Ellig, 2001). Hunt and Arnett (2006) observed that marketing success occurs when organizations develop competences in their business processes. In addition to this, Kyriakopoulos and Moorman (2004) pointed out that exploitation (operational) and exploration (dynamic) marketing strategies offer a relevant foundation for assessment of competitive advantage in a rapidly changing environmental setting, where efficiency, innovation, and development of new products could lead to higher performance levels (Kendall & Coleman, 2005; Schatzel, Iles, & Kiyak, 2005).

Because of the above attributes, IT is one of the key capabilities of an organization (see Figure 1). Information technology capability is the ability of the firm to perform a particular task or activity using IT resources (Helfat et al., 2007). These IT capabilities are used in all business initiatives to connect different parts of the firm and link to suppliers, customers, and allies (Weill & Vitale, 2001). Zollo and Winter (2002) distinguished dynamic capabilities from operational capabilities. Operational IT capability is defined as the routine activities, using IT, that enable an organization to perform its ongoing task of making a living and maintaining the status quo (Helfat et al., 2007). Operational or functional capabilities reflect the ability to effectively execute routine day-to-day activities. Thus, operational IT capabilities could have a partial impact in market-based economies.

In contrast, dynamic IT capability is defined as the capacity of an organization to purposefully create, extend, or modify its resources, using IT (Helfat et al., 2007; Wang & Ahmed, 2007). This implies that dynamic IT capabilities can modify or extend organizational dynamic capabilities to cope with change. Change in the resources of an organization implies only that the organization is doing something different, but not necessarily better, than before. This excludes any sort of automatic expectation of corresponding superior performance (Helfat et al., 2007; Wang & Ahmed, 2007; Winter, 2003). In this sense, IT capability, whether operational or dynamic, reinfoces the interaction between IT infrastructure and business activities, whether in the use of IT resources in the routine business activities or in the use of the capacity of an organization to purposefully create, extend, or modify its resources (Helfat et al., 2007; Wang & Ahmed, 2007).

To qualify as a capability rather than simply as ad hoc problem solving, IT capability must contain some patterned element (Helfat et al., 2007; Wang & Ahmed, 2007; Winter, 2003). This patterned element distinguishes operational and dynamic IT capabilities from some sort of innate talent or from one-time idiosyncratic change to the resources of an organization. Helfat et al. (2007) reasoned that what distinguishes operational IT capability from dynamic IT capability is the intention of the actions. Dynamic IT capabilities reflect some degree of intent, even if not fully explicit, while operational IT capability consists of rote organizational IT activities that lack intent (Dosi, Nelson, & Winter, 2000). That is, the intentional attribute differentiates the patterned aspect of dynamic capability from operational IT capability. The intentional element also distinguishes dynamic capabilities from accident or luck. Intent does, however, incorporate emergent streams of activity that have some implicit aim, even if not fully planned. Managers lower down in the organization make decisions to perform emergent activities in reaction to changes in the external environment, even when top management has not explicitly directed the manager to take these steps (Helfat et al., 2007). Through time, dynamic IT capability will be converted to operational IT capability (Helfat et al., 2007), and because of the IT investments path dependency, operational and dynamic IT capabilities interact and will exert control on new IT investments (Teece et al., 1997, pp. 522-523).

Pavlou and El Sawy (2006) found that the relationship between capabilities and competitive advantage is more positively related through dynamic capabilities than without them. Such capabilities can also arise outside

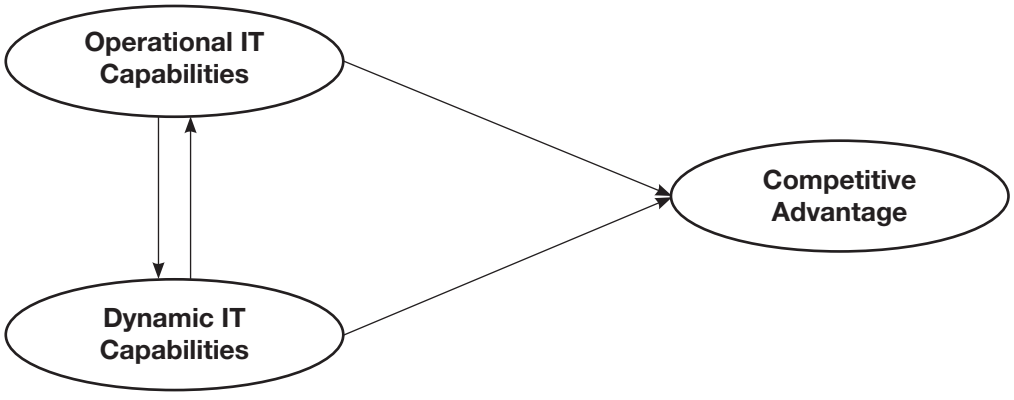

Figure 1. A Capability Oriented Framework of IT Business Value.

of the resource unit due to effective leveraging of their functionalities by clients, which illustrates the human-capital development aspect of capability beyond managers and people in terms of recruiting and training end users to effectively develop their potential. This indicates that competitive actions mediate the relationships between organizational capabilities and a firm's competitive advantage (D'Aveni, 1994). Taking into consideration Ma's (2000) proposal that competitive advantage is reached by achieving product effectiveness (quality and innovativeness) and process efficiency (time to market, low cost) (Henard & Szymanksi, 2001), I expect, in this study, to find a relationship between these operational and dynamic IT capabilities and competitive advantage (Pavlou & El Sawy, 2006). Therefore, on account of the complexity of IT (Collis, 1994) and path dependence (Teece et al., 1997), the theoretical frame presented in this study will posit that the effect of operational IT capabilities on competitive advantage is fully mediated by dynamic IT capabilities.

Assumptions

The research and analysis will be conducted at the firm level by senior professional and/or graduate students. The unit of analysis will be the general managers, IT managers, administrative professionals, and IT professionals who fulfill the following criteria: They hold a university degree, hold a professional organizational position, have at least 5 years of experience, and have relevant experience in their field. The other unit of analysis will be the senior professionals who are studying in a postgraduate program at CENTRUM of the Pontificia Universidad Católica del Perú (CENTRUM-PUCP). Another assumption is that all the questions on the questionnaire will be given the same interpretation by each unit of analysis.

Limitations and Delimitations

The study will be limited to the knowledge of the subjects surveyed and to the research culture that the subjects have. Furthermore, the lack of secondary information about IT investments, profitability, sales and market growth, and product and service innovations are additional limitations. Finally, one of the main limitations is the insufficiency of financial support for this kind of study. This study will be confined to IT capability and will not take into consideration other organizational capabilities that could affect competitive advantage. It will also be confined to surveying, specifically, the financial, industrial, and service sector of Lima, Peru, excluding other sectors. This study will be focused on IT competencies for new and ongoing products, and firms' competitive advantage. In addition, this study will be cross-sectional only. The unit of analysis will be delimited to senior professional from the firms and the graduate students of Centrum-PUCP. This study will not capture all other different components nor will it cover all existing stakeholders.

Summary

The rivalry among firms has intensified in the last 20 years due to the globalization of and aggressiveness towards the insurgent markets as well as domestic competition (Chandra, Fealey, & Rau, 2006). One of the key factors for the outcome of this intense rivalry is the use of information technology (IT) as a competitive weapon (Broadbent, Weill, & Clair, 1999; Sambamurthy & Zmud, 2000). This rivalry has resulted in a considerable amount of money being invested by organizations -around US$1.0 trillion in 2007 (IDC, 2007)-. However, due to the contradictory findings regarding the payoffs of these IT investments (Brynjolfsson & Hitt, 1996, 2003; Devaraj & Kholi 2003; Orlikowski & Iacono 2001), evaluating the effectiveness of IT has become a critical issue (Kanungo, Duda, & Srinivas 1999, Pavlou & El Sawy, 2006; Sethi & King, 1994). The impact of operational and dynamic IT capabilities on competitive advantage will be evaluated in this study. This evaluation will have as a setting the financial, industrial, and service sectors of Lima, Peru. The methodology employed will be descriptive-explanatory, the logic deductive, and the paradigm quantitative.

CHAPTER 2: LITERATURE REVIEW

This chapter will cover the following topics: (a) capability, (b) information technology, (c) information technology capability, (d) frameworks for studying IT business value, (e) competitive advantage, and (f) IT capability and competitive advantage.

Capability

The resource-based view of the firm (RBV) is an influential theoretical framework for understanding how competitive advantage might be sustained over time (Barney, 1991; Peteraf & Barney, 2003; Wernerfelt, 1984). This perspective focuses on the internal organization of firms and so is a complement to the traditional emphasis on strategy in industry structure and strategic positioning within that structure as the determinants of competitive advantage (Itami, & Roehl, 1987). Itami and Roehl (1987) claimed that RVB focuses on strategies for exploiting and exploring existing firm-specific assets. The RBV also invites consideration of managerial strategies for developing new capabilities, and if the control over scarce resources is the source of economic profits, then it follows that such issues as skill acquisition, the management of knowledge, know-how, and learning become fundamental strategic issues. These resources are difficult to build, and their construction takes a considerable amount of time.

Amit and Zott (2001) emphasized that the resource-based view (RBV) of the firm, which builds on Schumpeter's perspective on value creation, views the firm as a bundle of resources and capabilities. The supposition is that, even in equilibrium, firms may differ in terms of the resources and capabilities they control, and that such asymmetric firms may coexist until some exogenous change occurs. Hence, RBV theory postulates that the services rendered by the firm's unique bundle of resources and capabilities may lead to value creation. A firm's resources and capabilities "are valuable if, and only if, they reduce a firm's costs or increase its revenues compared to what would have been the case if the firm did not possess those resources" (Barney, 1997, p. 147). Resource-based theories (Barney 1991; Wernerfelt, 1984) see the superior firm's performance emerging from a unique combination of resources that are scarce, valuable, and difficult to imitate. Empirical studies of firm performance, using the resource-based view (RBV), have found differences not only between firms in the same industry (Hansen & Wernerfelt, 1989, cited in Wade & Hulland, 2004) but also within the narrower confines of groups within industries (Cool & Schendel, 1988). This suggests that the effects of individual, firm-specific resources on performance can be significant (Ray, Barney, & Muhanna, 2004; Ray, Muhanna, & Barney, 2005). Resources that are valuable and rare and whose benefits can be appropriated by the owning (or controlling) firm provide it with a temporary competitive advantage. That advantage can be sustained over longer periods of time, to the extent that the firm is able to protect itself against resource imitation, transfer, or substitution. To extend this concept to incorporate rapid technological and environmental change, the dynamic capabilities framework (Teece et al., 1997) has been proposed as a unified framework to distinguish firms' unique advantages as a function of their evolutionary history, their assets, and their organizational practices. Teece et al. (1997) claimed that firms derive advantage from a combination of specific assets, defined in terms of both tangible (technological and financial) assets and intangible (structural, institutional, and market structure) assets, and organizational boundaries. They reasoned that "a firm's previous investment and repertoire of routines constrain its future behavior" (Teece et al., 1997, pp. 522-523) and that "opportunities for learning will be 'close in' to previous activities and thus will be transaction and production specific" (Teece et al., 1997, p. 523). Eisenhardt (2000) maintained that it is not the specific assets that lead to competitive advantage but the dynamic capabilities. Eisenhardt also pointed out that dynamic capability is idiosyncratic in its details and path-dependent in its emergence, has significant commonalities across firms, and can be homogenous, fungible, and substitutable. Dynamic capability can be applied in routine, experiential, and fragile processes, with predictable and unpredictable outcomes. It can be seen to be a function of the market environment: stable, moderately dynamic, or high-velocity. Eisenhardt argued that since the functionality of dynamic capability can be duplicated across firms, its value for competitive advantage lies in the resource configuration and use that it creates, not in the capability itself. Dynamic capability can be used to enhance existing resource configuration in the pursuit of long-term competitive advantage.

Information Technology

Information technology research based on resource started at the beginning of the 1990s (Clemons & Row, 1991). Much of this work has included attempts to identify and define either a single IT resource or sets of IT resources. These resources consist of sharable IT technologies that support decision making for solving business problems in relationship with unit management, sharing risk and responsibilities. Several other researchers (Aral & Weill, 2004; Kholi & Jaworski, 1990; Powell & Dent-Micallef, 1997) divide IT resources into two categories that can broadly be defined as IT assets (technology-based) and IT capabilities (system-based). IT assets (infrastructure) include investments in connectivity, systems integration, and data storage that may be used by multiple applications. In this context, IT assets are a collection of technologies, people, and processes that facilitates scale connectivity and effective interoperation of an organization's IT applications (Kumar, 2004; Melville, Kraemer, & Gurbaxani, 2004). Thus, organizational reliance on IT continues to grow and is in part reflected by the large sums of money being spent on its adoption. In 1980, the IT capital as a share of capital stock was 7.5% for all industries in the United States. By 1991, its share of capital had almost doubled to 13.8% for all industries (Roach, as cited in Davamanirajan, Mukhopadhyay, & Kriebel, 2002). Over a 5-year period, the average dollar investment in IT rose by more than 5.6 % each year (IDC, 2007). IT is the single largest capital expense in the U.S.A. (Weill & Broadbent, 1998). The large investments in IT have had a major impact on how firms operate. Indeed, IT has become a necessity for survival. In 2000, the manufacturing sector had the highest expenditure (31%), followed by IT services (26%), and financial service (21%). In Peru, IT investment for 2004 was estimated at US$611 million, and for 2005 at US$665 million (IDC, 2007). Despite these huge IT investments, researchers who have conducted empirical studies on the relationships between IT investments and firm profitability have generally reported mixed findings (Barua, Kriebel, & Mukhopadhyay, 1995). Research has indicated that IT assets (infrastructure) are the easiest resources for competitors to copy and, therefore, represent the most fragile source of sustainable competitive advantage for a firm (Leonard-Barton, 1992; Teece et al., 1997). From a methodological viewpoint, characteristics of the samples used, measurement errors, and failure to

control for other industry and firm internal and external factors, such as the market orientation (Day, 1999; Kholi & Jaworski, 1990; Narver & Slater, 1990) that influences firm performance, have been cited as the primary reasons for the unexpected results (Brynjolfsson & Hitt, 1996; Hitt & Brynjolfsson, 1996). In contrast, there is growing evidence that competitive advantage often depends on a firm's superior deployment of capabilities (Christensen & Overdorf, 2000; Day, 1994, Wade & Hulland, 2004).

Information Technology Capabilities

Ross, Beath, and Goodhue (1996) maintained that the value of IT lies in the development of an especially effective IT capability: the ability to control IT-related cost, deliver systems when needed, and foster business objectives through IT implementations with a market-oriented perspective (Day, 1994, 1999; Narver & Slater, 1990). They claimed that this capability derives from careful management of the following three key IT assets: (a) a highly competent IT human resource, (b) a reusable technology base, and (c) a strong partnering relationship between IT and business management. The human asset is an IT staff that consistently solves business problems and addresses business opportunities through information technology. The technology asset consists of sharable technical platforms and databases. A valuable technology asset is essential for integrating systems and making IT applications cost effective in their operation and support. Two distinguishing characteristics of the technology asset are well-defined technology architecture and data and platform standards. The relationship asset consists of IT and business unit management, which share the risk and responsibility for the effective application of IT in the firm. This requires trust and mutual respect between IT personnel and clients and an ability to communicate, coordinate, or negotiate quickly and effectively. The strong relationship asset includes business partner ownership of, and accountability for, all IT projects and top management leadership in establishing IT priorities. The three IT assets, although quite distinct, are highly interdependent; the assets are mutually reinforcing. IT assets lead to business value through their impact on a firm's IT planning, delivery, and operations, and support processes. To the extent that these processes are strategically aligned, fast, and cost effective and are market-oriented to cope with market opportunities and threats, they result in competitive, important IT-enabled business capabilities that could lead to a sustainable competitive advantage.

While trying to define IT capabilities as a whole has been an active research for most researchers, others have taken the approach of finding specific IT capabilities (Burke & Menachemi, 2004; Khatri, 2006; Saini & Johnson, 2005; Sander & Premus, 2005). The first attempts to define various components of IT capability as proprietary technology, technical skill, and managerial IT skill suggested that only managerial IT skill can provide sustainable advantage (Khatri, 2006). Tipping and Sohi (2003) defined IT capability of a firm as the extent to which a firm is knowledgeable about and effectively utilizes IT to manage information within the firm. I would suggest that IT capability has three components: IT knowledge (a body of technical knowledge about objects, such as computer-based systems), IT operations (the extent to which a firm utilizes IT to manage market and customer information), and IT objects (computer-based hardware, software, and support personnel). Bharadwaj (2000) defined a firm's IT capability as its ability to mobilize and deploy IT-based resources in combination with other resources and identified three dimensions: IT infrastructure, IT human resources, and IT-enabled intangibles. Khatri (2006), in the health-care sector, expanded IT-enabled intangible capability, as defined by Bharadwaj, into three capabilities: (a) a professionally competent CEO and an enlightened top management, (b) an elevated status of IT in the organization, and (c) a trusting relationship between IT managers and line managers. In the same vein, Saini and Johnson (2005) found that IT capabilities for e-commerce give the required synergies to enhance a firm's competitive advantage and that IT capability can be directed to cost reduction, to achieve better efficiency, to reach higher productivity or to produce new products and services. Khatri argued that IT capability is better viewed as an organizational-level capability rather than as a function-specific capability because developing IT capabilities will be viewed as the overall organizational responsibility. From this perspective, top leadership is an important component of IT capability, rather than an external agent, with a key impact in their integration, construction, and dissemination of IT capabilities (Khatri, 2006). Results indicate that firms with high IT capability tend to outperform firms with low IT capability on a variety of profits and cost-based measures (Bharadwaj, 2000; Sambamurthy, Bharadwaj, & Grover, 2003).

Collis (1994) was particularly explicit in making the point that two types of capabilities exist: operational and dynamic IT capabilities. Collis first identified these operational capabilities as ordinary capabilities, and, later, Winter (2003) named them operational capabilities. Zott, cited in Winter (p. 98), related dynamic capabilities not only to operational capabilities but also to firm performance, stating that "dynamic capabilities are indirectly linked with firm performance by aiming at changing a firm's bundle of resource, operational routines, and competencies, which in turn affect economic performance". According to Helfat et al. (2007), a capability, whether operational or dynamic, is the ability to perform a particular task or activity. By extension, information technology capability is defined as the ability of the firm to perform a particular task or activity using an IT resource base. This IT resource base, when it is used in all business initiatives to connect different parts of the firm and link to suppliers,

customers, and allies, is an IT capability (Weill & Vitale, 2001). Operational IT capability is defined as the routine activities that use IT and enable an organization to keep the business running (Helfat et al., 2007). In contrast, dynamic IT capability is defined as the capacity of an organization to purposefully create, extend, or modify its resource base to cope with change, using IT (Helfat et al., 2007). Helfat et al. (2007) stressed that the word capacity refers to the ability to perform a task in at least a minimally acceptable manner. Thus, if an organization has dynamic capability, it can alter its resource base in at least some minimally satisfactory manner. Capacity also means that the function that a dynamic capability performs is repeatable and can be reliably executed to at least some extent. This implies that a dynamic IT capability consists of patterned and somewhat practiced IT activity. They argued that the word purposefully also has a specific meaning. This word indicates that dynamic IT capabilities reflect some degree of intent, even if not fully explicit. This distinguishes dynamic IT capability from organizational IT routines, which consist of rote organizational IT activities that lack intent (Dosi, Nelson, & Winter, 2000). Helfat et al. (2007) also argued that in using operational IT capabilities, the organization also has the capacity and the purpose to enable firms to perform their ongoing task of making a living. However, the words create, extend, or modify in the definition of dynamic capability do not apply to operational capabilities. The word *create* includes all forms of resource creation in an organization, including obtaining new IT resources, through acquisition and alliances, as well as innovation and entrepreneurial activities. Organizations also can extend their current resource base in the direction of more of the same. An organization can modify its resource base in order to change its businesses, including the response to change in the external environment. Helfat et al. (2007) maintained that dynamic IT capabilities also incorporate search and selection. The creation of resources through acquisition, new product development, and new product introduction require search and selection, which entail decision making. Dynamic IT capabilities pertain to both an organizational unit and to an individual decision maker. Acknowledgment of the role of individuals suggests the importance of understanding managerial decision making under conditions of change. On the other hand, one of the main mechanisms for creating value is through operational IT capabilities, which are best represented by the value chain (Porter, 1985; Sethi & King, 1994)

The value chain is a widely used and accepted tool for assessing business activities and identifying competitive advantage (Brynjolfsson & Hitt, 1996; Evans & Smith, 2004, Porter, 1985). Based on this conception, Sethi and King developed the construct competitive advantage provided by information technology application (CAPITA), which included competitive efficiency as the impact of an IT application on enterprise-level performance (Bakos & Treacy, 1986), business value as the impact on profitability, on market share, and on market size (Bergel et al., as cited in Sethi & King, 1994), and operational efficiency as the impact on intermediate operating cost (Banker & Kauffman, as cited in Sethi & King, 1994), This construct also included management productivity as the impact on return-on-management, competitive forces as the impact on buyer, on suppliers, on substitute products, on new entrant, and on rivalry (Porter, 1985), strategic thrusts as the impact on differentiation, on cost innovation, on growth, and on alliance, and customer resource life cycle as the impact on activities undertaken by consumers to acquire a resource (Yves & Learmonth, as cited in Sethi & King, 1994). CAPITA has seven dimensions: (a) primary activity efficiency, (b) support activity efficiency, (c) resource management functionality, (d) resource acquisition functionality, (e) threat, (f) pre-emtiveness, and (g) synergy.

Frameworks for Assessing IT Business Value

The theory of competitive strategy in IT business value has attracted the attention of several researchers, such as the pioneer work of Venkatraman (1991) and Scott-Morton (1991), who served as program director of the school-wide Management in the 1990s Research Program. This program was created in 1984 to explore how IT would affect the way organizations would be able to survive and prosper in the competitive environment of the 1990s and beyond. The basic assumptions of this program were that the business environment was and would remain turbulent, and IT would continue its rapid evolution over at least the following decade, both predictions which proved to be realities in later years. This program developed the MIT'90 framework, in which an organization was thought of as comprised of five sets of forces in dynamic equilibrium among themselves, moving through time to accomplish the organization's objectives. This framework emphasizes a close system perspective for studying IT business value from the theory of competitive strategy.

Bharadwaj (2000) developed the concept of IT as an organizational capability, taking the resource-based view and empirically examining the association between IT capability and firm performance. Results indicated that all of the profit ratios in each of the 4 years under observation were significantly higher for the IT leaders, when compared to the control sample of firms. Viewed from a resource-based perspective, the empirical findings indicated that IT capability is a rent-generating resource that is not easily imitated or substituted. The leverage of IT capability for competitive advantage is contingent on the sustenance and enhanced investments that firms have to make. Aral & Weill (2004) disaggregated the firms' total IT investments and examined the relationships between specific IT assets and performance measures. They hypothesized that firms harmonizing specific IT assets with specific capabilities

perform better. Their findings suggested that high performance firms allocate IT investments according to their strategic goals and harmonize particular organizational capabilities with particular IT assets, demonstrating that assets and specific capability are complementary. Kumar (2004), acknowledging prior researchers who have recognized the importance of a flexible IT infrastructure as a source of competitive advantage, expanded the idea that the value of an IT infrastructure depends on its use in an organizational context. The framework proposed by Kumar was based on the theory of financial asset valuation, and recognized that the value of IT infrastructure is dynamic and in some respects similar to the value of financial assets. Kumar proved empirically that IT infrastructure is a dynamic (time-varying) asset concept, whose value follows a stochastic process.

Barua, Kriebel, and Mukhopadhyay (1995) claimed that by attempting to relate IT expenditures directly to output variables at the level of the firm, through a microeconomic production function, the intermediate processes through which IT impacts arise are ignored. Concern grew that the effect of IT on enterprise-level performance could be identified only through "a web of intermediate level contributions" (Barua, Kriebel, & Mukhopadhyay, 1995, p. 6). A similar approach was suggested by Porter (1985). Barua, Kriebel, and Mukhopadhyay demonstrated empirically that, in fact, IT impact exists and that it can be detected when the analysis is executed at a lower level in the firm (i.e., at the strategic business unit stage (SBU) or within the SBU rather than at corporate level), and that the lower level impacts, in turn, affect higher level performance measures (Barua, Kriebel, & Mukhopadhyay, 1995). Chan (2000), in a comprehensive review of IT value articles, suggested that researchers may be better served by emphasizing theory generation and reducing the reliance on isolated, input-output approaches and if IT value is discussed meaningfully in the context of the organization's goals, strategies, cultures, structure, and environment, IT investments can be usefully viewed as organization change initiatives. Barua, Kriebel, and Mukhopadhyay and Tallon, Kraemer, and Gurbaxani (2000) showed empirical results in which IT investment had a positive effect on a firm's competitive advantage, with a different approach, taking as intermediate variable the business processes. The contribution of these authors has been to heighten the measurement problem when IT payoffs are measured directly. They proposed that the value of IT payoffs should be measured through analyzing the business processes. The results of this analysis confirmed that strategic alignment is related to payoffs from IT at the process level. The process-oriented assessment of IT business value is based on the argument that the first-order impact of IT investment occurs at the process level (Barua, Kriebel, & Mukhopadhya 1995; Mooney, Gurbaxani, & Kraemer, 2001). Those who took this process-centric perspective argued that IT creates values for the organization by improving individual business processes, or inter-process linkages, or both. Consequently, the greater the impact of IT on individual business processes and on inter-process linkages, the greater will be the contribution of IT to firm performance (Tallon, Kraemer, & Gurbaxani, 2000). Kumar expanded on the idea that the value of IT infrastructure depends on its use in an organization context.

Another group of researchers have argued that IT business value is captured through IT capabilities (Bharadwaj, 2000; Saini & Johnson, 2005). They maintained that IT investments can be copied, imitated, or substituted in a short time, while IT capabilities are more difficult to imitate and present a greater mobility, given their flexibility and ability to cope with market opportunities and threats (Sambamurthy, Bharadwaj, & Grover, 2003). Pavlou and El Sawy took the process perspective and capability view in the context of new product development (NPD). They introduced the construct of IT-leveraging capability and proposed that this IT-leverage capability indirectly influences competitive advantage through dynamic capabilities.

Competitive Advantage

Ma (2000) argued that competitive advantage is perhaps the most widely used in terms of strategic management, yet it remains poorly defined and operationalized. Ma made three observations: first, competitive advantage does not equate to superior performance; second, competitive advantage is a relational term; and, third it is context-specific. According to Ma, the structural approach (Porter, 1980, 1985) and the resource-based view (RBV) (Ray, Barney, & Muhanna, 2004; Rumelt, 1984; Wernerfelt, 1984) are two dominant perspectives in strategic management for explaining competitive advantage, but neither perspective readily differentiates competitive advantage from superior performance. Ma also noted that the structural approach posits that strong, defensible market position in an attractive industry renders sustained competitive advantage (Porter, 1980, 1985). Industry positioning in either cost or differentiation plays an important role in determining the firm's competitive advantage. Ma gave counter examples to show that either cost advantage or differentiation advantage is sufficient and necessary for superior performance, and argued that superior performance could also come from other types of competitive advantage, for example, speed (Stalk, 1990) or flexibility (Sanchez, 1993, 1994, as cited in Ma, 2000), or perhaps, more practically, a combination of multiple competitive advantage.

Ma observed that two types of competitive advantage can be conceived: heterogeneous (binary) and homogeneous (differential). The RBV hinges on both concepts such as resource heterogeneity and differential between rivals (Ray, Barney, & Muhanna, 2004; Rumelt,

1984). Heterogeneity seems to suggest that one firm possesses a unique resource and other firms cannot imitate or match it. However,

"if firms by and large could imitate rivals' resources and products, then these firms are by definition competing on some common dimension. In such cases, on these common dimensions at least, competitive advantage is the differential between rivals, regardless of whether some of them also have heterogeneous competitive advantage based on other unique dimensions of resources or products. Such differential in (homogeneous) firm resources is perhaps the most commonly observed form of competitive advantage, for instance productivity and other efficiency-related factors" (Ma, 2000, p. 19).

According to its compound, Ma suggests that competitive advantage could be a single discrete advantage or a multiple discrete advantage that works together as an integrative whole. Typical compound competitive advantages include efficiency of organization and production process. Jap (2001) proved empirically that specialized investments facilitate the attainment of joint competitive advantages, and these advantages are positively correlated with economic outcomes, organizational behavior, and expectations of continuity. Kusunoki, Nonaka, and Nagata (1998) proposed, based on compound competitive advantage, that competitive advantage is achieved by concurrently achieving product effectiveness (quality and innovativeness) and process efficiency (time to market and low cost). Henard and Szymanski (2001) found that both process efficiency and product effectiveness have been individually linked to a firm's performance.

Information Technology Capabilities and Competitive Advantage

IT capabilities create value depending on the role and use they are given (Devaraj & Kholi, 2003; Orlikoswski & Iacono, 2001) and on the particular type of technology (Aral & Weill, 2004) but, over all, for being intertwined with business strategies (Kraemer, Dedrick, & Yamashiro, 2000; Smith & McKeen, 2002a, 2002b). This value emerges primarily through IT capability's complementarity and integration with business strategies, organizational design, structures, and capabilities. IT capabilities are an enabler of strategic adaptation of environmental changes through a set of IT systems, allowing new product development, integration of operational processes and functions, technological and market knowledge creation, and internal and external communication (McKeen & Smith, 2002; Sambamurthy, Bharadwaj, & Grover, 2003; Smith & McKeen, 2003). They enhance the internal and external distribution of products and services, providing access to all the employees so they may give quick and efficient responses to their customers and allowing multiple access points for easy communication for the customers, without restriction because of where they are, as well as enabling daily work with better information quality, at the place and time and in the format that is required (McKeen & Smith, 2002). These IT capabilities improve saving and cost reduction, eliminate noncompatible assets for integral systems, reduce the stop-machine time, and improve and streamline processing of the products and delivery of services. IT capability also supports workload distribution for increasing demands without any significant additional cost because of the automation of the manual processes and improvement in efficiency (McKeen & Smith, 2002; Sambamurthy, Bharadwaj, & Grover, 2003). IT capabilities influence the work environment through their user friendliness, noise elimination, significant reduction of paper, and lowering of stress (McKeen & Smith, 2002; Sambamurthy, Bharadwaj, & Grover, 2003). In addition, IT capabilities create value in the way assets and capabilities are used, in improved management of IT, integration and dissemination of information through the organization, in support in the retention of key customers, and in support in relationships with business partners. Other arguments for how IT creates value are in motivation for development, retention of personnel with high performance, enhancement of distribution, support in the optimization of investments, being on time with regulated government requirements, and increasing the worth of the firm (McKeen & Smith, 2002; Sambamurthy et al., 2003).

Summary

The literature review is concentrated on the strategic role of IT capability for enhancing competitive advantage. This review started with a discussion of the managerial theory that supports the capability concept. The resource-based view (Barney, 1991; Peteraf & Barney, 2003; Rumelt, 1984; Wernerfelt, 1984) has been used as the theoretical framework for understanding how competitive advantage (Ma, 2000) might be sustained over time. In terms of this theory, superior firms' performance can be shown to emerge from a unique combination of resources that are scarce, valuable, and difficult to imitate (Amit & Zott, 2001; Barney, 1991; Dierickx & Cool, 1989; Grant, 1991, Wade & Hulland, 2004). The dynamic capability (Teece, Pisano, & Shuen, 1997) framework extends the resource-based view to incorporate change, either in technology, market, or government regulations (Helfat et al., 2007). These capabilities can be seen to be a function of the market environment (Eisenhardt, 2000; Wade & Hulland, 2004). Dynamic capabilities, even though duplicated across firms, have value for competitive advantage in the resource configuration and use that they create, not necessarily in the capabilities themselves (Eisenhardt, 2000).

Information technology is one of the key resources of an organization (Aral & Weill, 2004; Bharadwaj, 2000;

Weill, 2004). This resource consists of sharable IT that supports decision making for solving business problems in relationship with unit management, thus sharing risk and responsibilities (Ross, Beath, & Goodhue, 1996). Several researchers have divided IT resource into assets and capabilities (Aral & Weill, 2004; Kholi & Jaworski, 1990; Powell & Dent-Micallef, 1997). They argued that IT assets are the easiest resource for competitors to copy and, therefore, represent the most fragile source of sustainable competitive advantage (Leonard-Barton, 1992; Teece et al., 1997). In contrast, there is growing evidence that competitive advantage often depends on a firm's superior deployment of capabilities (McKeen & Smith, 2002; Sambamurthy et al.,2003).

Information technology capability (Bharadwaj, 2000; Saini & Johnson, 2005, Sambamurthy et al., 2003) is the organization's ability to perform a particular task using IT resources (Helfat et al., 2007). The value of IT lies in the development of especially effective IT capabilities (Ross et al., 1996). IT capabilities, either operational or dynamic, integrate IT resources and business activities and interact directly on competitive advantage (Cepeda & Vera, 2007; Helfat et al., 2007). IT capabilities create value in the role and use they are given, depending on the type of technology, but overall by being intertwined with and enhancing business activities (Devaraj & Kholi, 2003; Kraemer, Dedrick, & Yamashiro, 2000; Orlikoswski & Iacono, 2001). IT capabilities are an enabler of strategic adaptation of the environmental changes through a set of IT systems, allowing development of new products, integration of operational processes and functions, creation of technological and market knowledge, and internal and external communication (McKeen & Smith, 2002; Sambamurthy et al., 2003; Smith & McKeen, 2003).

The framework used for evaluating the impact of IT on competitive advantage or performance has evolved from the observation of direct and indirect relationships (Aral & Weill, 2004; Brynjolfsson & Hitt, 1996) between IT investments and performance (Barua, Kriebel, & Mukhopaddhyay, 1995; Hitt & Brynjolfsson, 1996) through business processes (Barua, Kriebel, & Mukhopadhyay, 1995; Tallon, Kraemer, & Gurbaxani, 2000) or through dynamic capabilities (Sambamurthy, Bharadwaj, Grover, 2003). Using this framework, management scholars (March, 1991) identified two types of activities: exploitation (operational), associated with efficiency, and exploration (dynamic), associated with innovativeness. Theorists claim that these two activities impinge on different sets of capabilities and are in constant tension (Atuahene-Gima, 2005; Kyriakopoulos & Moorman, 2004).

Conclusion

A study of the literature shows that research into IT capability with a focus on dynamic capabilities is still in its infancy and the focus of interest has been diverse, with different authors looking at the nature of dynamic capabilities, their antecedents, outcomes, or associated processes (Cepeda & Vera, 2007). After 2005, definitions differentiate between operational (how one earns one's living) capabilities and dynamic (how one changes one's operational routines or how one reacts to change) capabilities (Helfat et al., 2007). Several authors have claimed that competitive advantage comes from new configurations of resources and operational capabilities and not from dynamic capabilities per se (Eisenhardt & Martin, 2000; Helfat et al., 2007; Makadok, 2001).

Chapter 2 includes a description of the relationships between IT capability and competitive advantage in an attempt to grasp the theory and concepts applied in research and to stress the temporality of the research questions. This chapter also includes the literature review and a discussion of the theoretical foundation for the study of IT capabilities and their relationship with a firm's competitive advantage (Jaworski, Kholi, & Sahay, 2000). This examination opens a new way of understanding the creation of value using IT capabilities and the mediating role of dynamic IT capability between operational IT capability and competitive advantage.

CHAPTER 3: METHODOLOGY

In this chapter, the methodology used to analyze the research problem will be described in detail, and the research questions and hypotheses will be formulated. This chapter will include the following topics: (a) research design, (b) appropriateness of design, (c) research questions, (d) research hypotheses, (e) population, (f) informed consent, (g) sampling frame, (h) confidentiality, (i) geographic location, (j) instrumentation, (k) data collection, (l) data analysis, and (m) validity and reliability.

The purpose of this quantitative research study is to describe and to explain the relationships between IT capabilities and a firm's competitive advantage. The conceptual framework is supported by theories derived from the literature review. The empirical analysis will be carried out in the financial, industrial, and service sectors of Lima, Peru. The nature of the research method will be descriptive-explanatory, the logic deductive, and the paradigm quantitative.

Research Design

Understanding and determining the effects of IT resources on firms' competitive advantage is one of the most complex issues that the majority of the business and information system executives face when they are confronted with IT investments and with building, integrating, and reconfiguring IT capabilities to cope with market opportunities or threats that lead to the undermining of superior performance. In most firms, information

technology business projects are assessed through analysis of IT investments per se and not through their IT capabilities (Devaraj & Kholi 2003; Bharadwaj, 2000; Orlikowski & Iacono 2001, Santhanam & Hartono, 2003).

Based on the research questions and the theoretical framework, the elaboration model (see Figure 2) will have as an endogenous variable, operational IT capabilities, dynamic IT capabilities and a firm's competitive advantage. The exogenous variables will be the first-order latent variables. The IT capability is defined as the ability of the firm to perform a particular task or activity using IT resources (Helfat et al., 2007). This IT capability is a combination of operational and dynamic IT capability. Operational IT capability is defined as the routine activities, using IT, that enable an organization to perform its ongoing task of making a living and maintaining the status quo (Helfat et al., 2007). The construct for assessing operational IT capability will be taken from Sethi and King (1994). The "Competitive advantage provided by information technology application" called CAPITA is a reflective second-order construct (Fornell & Larcker, 1981) with seven dimensions: (a) primary activity efficiency, (b) support activity efficiency, (c) resource management functionality, (d) resource acquisition functionality, (e) threat, (f) pre-emptiveness, and (g) synergy. Reflective indicators are determined by the construct and, hence, covary at the level of that construct (Hulland, 1999). Because the latent variable is viewed as a cause of the reflective indicators, these indicators are assumed correlated (Diamantopoulos & Winklhofer, 2001).

As proposed by Sethi and King, the primary activity effectiveness is defined as the capabilities that help work units with the inbound logistic, operation, outbound logistic, marketing, sales, and services, using IT. Support activity effectiveness is defined as the capabilities that help work units to deal with human resources, procurement, and firm infrastructure, using IT. Resource management facilities are defined as the capabilities that help work units to monitor, upgrade, transfer, and evaluate the overall effectiveness or usefulness of the resource, using IT. Resource acquisition facility is defined as the capabilities that help work units to order, acquire, or verify that the resource meets specification, using IT. Threat is defined as the impact of the IT application on the bargaining power of customer and supplier. Pre-emptiveness is defined as enabling the firm to enjoy first-mover advantages (Porter, 1980) resulting from generic lead-time as well as competitive asymmetry, using IT. Synergy is defined as an IT application's integration with business goal, strategies, and environment.

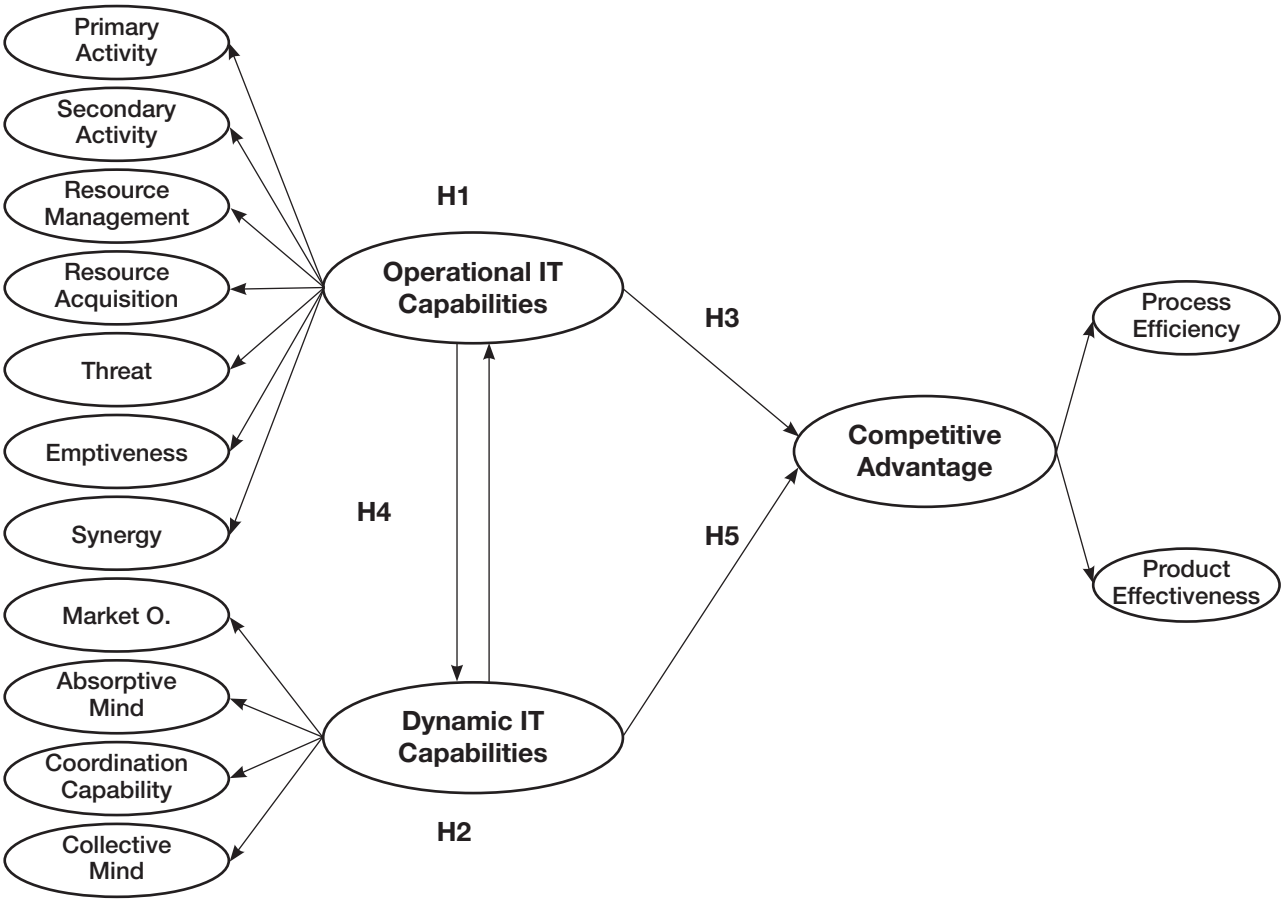

Figure 2. A Research Model of Information Technology Business Value.

The endogenous variable dynamic IT capability is defined as the capacity of an organization to purposefully create, extend, or modify its resources, using IT (Helfat et al., 2007), to address changing environments. The construct for dynamic IT capability will be taken from Pavlou and El Sawy. They identified four processes that constitute a dynamic capability that reconfigures the resources to better match the environment: sensing the environment, learning, coordinating activities, and integrating interaction pattern. Dynamic IT capability is conceptualized as a superordinate second-order construct, with four dimensions: (a) IT market orientation that senses the environment, using IT, (b) IT coordination for effective IT coordination, (c) absorptive capacity for effectiveness in learning, using IT, and (d) collective mind for integrating interaction pattern, using IT.

The endogenous variable competitive advantage is defined as a superordinate second-order construct, with product effectiveness and process efficiency as its first-order constructs (Henard & Szymanksi, 2001). Product effectiveness is defined as the improvement in product quality and functionality, major innovation in product as a whole, and creation of new product concepts. Product efficiency is defined in terms of time to market and low cost. The questionnaire will be adopted and modified from Pavlou and El Sawy.

Appropriateness of Design

The elaboration model of this study has been derived from the problem statement, the theoretical framework, and the purpose, which are supported by the literature, in order to make assessments in a context of changing environment, together with the description and explanation of the relationships between IT capabilities and a firm's competitive advantage. For making inferences, the sample population is identifiable, and the members of this sample population will be selected non randomly. This approach justifies the research design and is appropriate for the desired outcomes.

Research Questions

In the course of this study, answers will be sought to the following two research questions:

R1: Are the IT capability dimensions higher order constructs?
R2: Is there a relationship between IT capabilities and competitive advantages?

Hypotheses

The hypotheses derived from the research questions are:

$H_0$1: The operational IT capability is not a higher order construct.
$H_1$1: The operational IT capability is a higher order construct.
$H_0$2: The dynamic IT capability is not a higher order construct.
$H_1$2: The dynamic IT capability is a higher order construct.
$H_0$3: A direct relationship exists between operational IT capability and competitive advantage.
$H_1$3: No direct relationship exists between operational IT capability and competitive advantage.
$H_0$4: No interrelationship exists between operational IT capability and dynamic IT capability.
$H_1$4: A interrelationship exists between operational IT capability and dynamic IT capability.
$H_0$5: Dynamic IT capability does not mediate the relationship between operational IT capability and competitive advantage.
$H_1$5: Dynamic IT capability mediates the relationship between operational IT capability and competitive advantage.

Population

The research methodology will be a cross-sectional survey, and not an experimental design, with primary and secondary data sources, these being the outcomes observed in financial, industrial, and service sectors by the professionals of the firms and the graduate students of CENTRUM-PUCP from Lima, Peru.

Informed Consent

An informed consent letter will be given to each of the participants of this study, in which the degree to be obtained, the research title, and the purposes of the survey will be clearly stated. This letter will include an explanation of the meaning of participation on a voluntary basis, stressing that whether the person decides to participate in this research or not, participation will not be subject to any reward or penalty. It will be specified that the results of this study will be published with a complete reserve on participants' identification in any form whatsoever, and these results can be mailed to them if they wish. It will be emphasized that the answered questionnaire will be kept in strict confidentiality and if there are any questions, they can contact the researcher. All participants will be informed that they have given their consent.

Sampling Frame

The sample frame will be based on the firms' income of 2008, with a minimum sale of US$500,000 per year. It is assumed that the minimum investment in IT is 1% of the sales. The sample design will have three

strata: financial, industrial and service. Since there is no intention of establishing an independent conclusion for each stratum, these will not be taken as independent populations. The sample size will be around 200 cases, as suggested by Kline (2005). The sampling unit will be the firm, and the persons who will be interviewed will be senior professionals from firms and the graduate students from CENTRUM-PUCP from Lima, Peru.

Confidentiality

All the information gathered in this study will be kept in files, with a password that only I, the researcher, can access. The required security and confidentiality will be maintained, as well as the identification of the participants. Every single answer of the questionnaire will not be mentioned in this study, only the calculated average value, standard deviation and other aggregate parameters.

Geographic Locations

All the firms used in this study will be from the financial, industrial and service sector of Lima, capital of Peru. Lima will include the constitutional province of Callao. Peru is located in South America.

Instrumentations

All the measured items will be adapted from existing scales, using a Likert-type scale, except for the competitive advantage construct. Measurement of operational IT capabilities will be reflected in seven constructs: (a) primary activity efficiency, (b) support activity efficiency, (c) resource management functionality, (d) resource acquisition functionality, (e) threat, (f) pre-emptiveness, and (g) synergy. The questionnaire will be adapted from Sethi and King. Measurement of dynamic capabilities will be reflected in four constructs: (a) market orientation, (b) absorptive capacity, (c) coordination capability, and (d) collective mind, and of competitive advantage in two constructs: (a) product effectiveness, and (b) process efficiency. The questionnaire will be adapted from Pavlou and El Sawy.

Data Collection

Before the data are collected, the questionnaires will have a pre-test for content validity, through interviewing four well-known specialists in this field and five representative firms from the sample group. After the content validity test, a technical validation for construct validity will be carried out, using MBA students from CENTRUM-PUCP. After the questionnaires have been adjusted, the data will be collected with the help of a professional survey company with solid experience and a well-connected network of operational executives in the financial, industrial and service sector. The professional survey company and I, the author, will cooperate in contacting the participants from these sectors. Because I expect a high degree of reluctance to answer the questionnaire from the representatives of industries, the sample frame will include the graduate students of CENTRUM-PUCP from Lima, Peru. The data will be collected through interviews and via e-mail, using the adopted questionnaires. The questionnaire will be designed for direct data entry, using an Excel worksheet, without data encoding, and data filtering will be done for missing data and outliers. After the e-mail has been sent, a phone call will be used for contacting the participants immediately, as often as needed.

Data Analysis

The research model will have complex constructs and relationship structures that will be more amenable to SEM techniques than to linear regression. Covariance-based SEM (LISREL, EQS, and AMOS) is well suited for confirmatory research and theory testing. AMOS will be used for confirmatory factor analysis and hypotheses testing. Additionally, SEM is relatively robust to deviations from a multivariate distribution (Bollen, 1989; Hoyle, 1995). SEM analyses all the paths, both measurement and structural, in one analysis and supports convergent and discriminate validities as well as reliability and model validity (Gefen, Straub, & Boudreau, 2000).

Validity and Reliability

Two steps will be applied for the empirical validation: (a) assessment of the validity and reliability of the measurement model, and (b) internal validity and statistical conclusion validity for the structural model. The instrument validation for the measurement model is done to demonstrate that developed instruments will be measuring what they are supposed to be measuring, that is, that error terms between observations will be uncorrelated (Hair, Anderson, Tatham, & Black, 1995). The instrument validation will have three steps: (a) content validity, (b) construct validity, and (c) reliability.

Content validity refers to ensuring that questions in the research study are representative of a universal pool (Straub, 1989). In this study, even though all questionnaires will be adapted from the work of other researchers, I will try to obtain consensus in the pre-test from five academic experts in the field and five operational managers who are most representative of financial, industrial and service firms. Personal interviews will be conducted with each one in order to locate and correct weaknesses in the questionnaire instruments.

Construct validity refers to the measures chosen, that is, whether they are true constructs, describing the event, or merely artifacts. If they are valid, a relatively

high correlation between measures of the same construct can be expected when using different methods, and low correlation between measures of constructs may indicate lack of validity (Straub, 1989). The construct validity will be assessed through principal component factor analysis (Nunally, 1978). For convergent validity, Cronbach's alpha, a composite reliability and internal consistency measure, developed by Fornell and Larcker (1981), will be used. For discriminant validity, three tests will be used: (a) the average variance extracted-AVE (Fornell & Larcker, 1981), (b) analysis of common method variance of Harman's one-factor test (Ettlie & Pavlou, 2006), and (c) analysis of the correlation matrix.

Reliability refers to accuracy, to whether the subject has answered truthfully or in a way that is a function of his or her misunderstanding rather than a variation of the true score. High correlations between alternative measures, or large Cronbach alphas, are expected, which will show that the measures are reliable. Individual item reliability will be assessed by examining the loading (or simple correlation) of the measures with their respective construct (a rule of thumb is to accept items with loading of .7 or more, which means more than 50% of the variance in the observed variable is due to the construct). For the proposed second-order, a superordinate model of operational and dynamic IT capabilities will be tested with SEM (Edwards, 2001).

Hypothesis Testing

The superordinate second-order constructs of operational and dynamic capability and the structural model will be tested using SEM. The measure model formed by superordinate second-order constructs ($H_1$1 and $H_1$2) will be tested using the target (T) coefficient index (χ^2 first-order model/χ^2 second-order model) (March & Hocevar, 1985). For the structural model, the χ^2 and a set of indexes will be used, and an explicit calculation of the change in AIC index between competitive models will be carried out that provides an estimate of the statistical significance of each model (Hoyle, 1995).

The baseline-model (see Figure 2) will be formed by operational IT capability, dynamic IT capability and competitive advantage as the endogenous variables, and all the first-order latent variables as exogenous variables. The operational IT capability is interrelated to dynamic IT capability and competitive advantage. Dynamic IT capability will be taken as a mediating variable between operational IT capability and competitive advantage. The structural model will be used to analyze the hypotheses $H_1$3, $H_1$4, and $H_1$5.

In order to contrast the base-line model, three competitive models will be tested. The competing models will assume no feedback between operational IT capability and dynamic IT capability. Model-1 will evaluate dynamic IT capability as a mediator between operational IT capability and competitive advantage, and competing model-2 will evaluate operational IT capability as a mediator between dynamic IT capability and competitive advantage. Model-3 will evaluate operational IT capability and dynamic IT capability without any relationship between them. These IT capabilities will be related only to competitive advantage. To select one or more models from a set of plausible models, the Akaike's information criterion (AIC) will be used. In general, the smaller the values of AIC, the better the fit of the implied model.

Summary

In this chapter, the research design, which was logically derived from the problem under investigation, was described. The research questions guided the deductive and quantitative paradigm that is supported by the theoretical framework and the purpose of this study. The quantitative design has been shown with enough detail, providing a complete description and definition of all components of the model. The variables that form the model are operational IT capabilities, dynamic IT capabilities and competitive advantage as endogenous variables and all first-order latent variables as exogenous variables. The logical sequence of events has been presented, and detailed explanations of the population, the informed consent letter, confidentiality, and geographic location have been given. The instrumentation procedures for each latent and observable variable have been presented, clearly indicating the source of each questionnaire with a 5-point Likert-type scale. The procedures for the data collection have been described. The main data will be collected by interview and by e-mail from the financial, industrial and service sector, and from graduate students of CENTRUM-PUCP. The data analysis has been presented in sequential steps, beginning with the examination of the ordinal data and followed by the metric data. Second, a pre-test has been included to test for validity and reliability of each construct. Third, an approach has been presented for ensuring the reliability and validity of the reflective and formative constructs. The procedure for the data analysis to answer the research questions has been defined, corresponding to each research hypothesis.

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