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A Dynamic Capabilities Approach to Understanding the Impact of IT-Enabled Businesses Processes and IT-Business Alignment on the Strategic and Operational Performance of the Firm

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Abstract:

For the past two decades, researchers have sought to understand how IT investment leads to organizational success. However, this has proven to be an elusive goal. We posit that a new perspective is needed to better understand IT investment. We must examine how the investment is enacted and reflected within the firm. We will argue that investment is enacted within the technology resources and corresponding business processes and reflected in the IT-business alignment. Based on the literature within Dynamics Capabilities Theory and IT-Business Alignment, we will propose a theoretical model that seeks to understand the impact of IT-enabled business processes and IT-business alignment on the strategic and operational success of a firm and whether the impacts experience a lag effect. Using data from fifty-eight European firms over a two-year period, we will build a structural equation model to test our theoretical model. The results indicate that alignment is important for strategic and operational success in year 1 but not in year 2. Furthermore, of the two, alignment has a stronger impact on strategic than operational success. In contrast, business process performance has an impact on organizational performance in year 1 and year 2. For both years, the impact on operational success is stronger than the strategic one. We also notice that the impact of business process performance on operational success decreases between year 1 and year 2, whereas the impact on strategic success is stronger in year 2 than in year 1.

Keywords: Alignment, IT-enabled business process, Resource-Based View, Dynamic Capabilities Theory

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I. INTRODUCTION

The topic of the value of IT-driven business success has a long history within the IS literature. Throughout the history of the IS discipline, various researchers have strived to understand how IT contributes to the strategic and operational success of the firm using assorted lenses and competing theoretical models. However, our review of the literature suggests that two approaches have dominated our literature—the Resource Based View and IT-business alignment. According to the Resource Based View [Melville et al. 2004], IT performance is a function of the extent to which IT resources have been channeled into the production of effective IT-enabled businesses processes. The success of the IT-enabled business processes enables strategic and operational success of a business. On the other hand, the IT alignment approach [e.g., Chan et al. 1997b; Henderson and Venkatraman 1992; Kearns and Lederer 2000; Cragg et al. 2002; Slaughter et al. 2006; Avison et al. 2004] argues that the alignment of IT and business strategies will lead to improved organizational performance.

We start with the assumption that neither enabling business processes with IT nor strategically aligning the IT with business strategies is sufficient in itself to achieve organizational performance. In other words, simply enabling business processes and neglecting alignment does not enable an organization to achieve the desired performance. Alternatively, focusing solely on alignment and neglecting business processes will also not result in success.[1] We do not believe that our colleagues in practice have fully neglected one at the expense of the other. However, we do believe that a limitation, both within literature and in practice, is a failure to understand the joint impact that simultaneously enabling both will achieve. Therefore, it is our thesis that the *joint impact* of these two approaches enables firms to grow.

However, when will this growth occur? And, how will this growth manifest itself? In this study, we will suggest that the lagged effect of the impact of IT investments [as noted by Bakos 1998 and Devaraj and Kohli 2003] has not been considered—i.e., does it take a period of time before IT enabled business processes and IT-business alignment impact the performance of the organization? Specifically, our research objective is *to understand the impact of IT-enabled business process performance and IT-business alignment on the strategic and operational performance of a firm*. Further, we seek to understand if there is a lag effect of these factors on performance.

Yet, what is meant by performance? To understand the organizational impact of business process and alignment, we are interested in examining two levels of performance—the strategic level and the operational level. One could hypothesize that business processes, while enabling an organization to be more efficient at the operational level, would not necessarily facilitate strategic changes in the organization. Alternatively, although we could hypothesize that aligning IT and the business will lead to more strategic improvements, it is not clear that alignment enables an organization to be more efficient at the operational level. These postulations are not based on past empirical work, but they highlight a gap in the literature and demonstrate the need to understand the impact of business processes and alignment on operational and strategic level performance.

Furthermore, we are interested in understanding the lag effect, or at what point the impacts occur. Should an organization expect to receive an impact from IT-enabling business processes in the same year in which they implement the processes? And, similarly, does aligning IT with the business impact the organization instantaneously, or does the impact become measureable only after an extended period of time?

While our focus is on these two enablers of business performance, and we position our work within these domains of research, we extend our analysis to also include IT investment. For the past two decades, we have sought to understand how IT investment leads to organization success. However, as we will point out, this has been an elusive goal. We posit that a new perspective is needed in IT investment; we must examine how investment in IT is enacted and reflected within the firm. We will argue that investment is enacted within the technology resources and corresponding business processes and reflected in the IT-business alignment. It is our thesis that instead of focusing solely upon the concept of investment, we should shift our focus to understanding the two contrasting approaches of alignment and IT-enabled business process performance to explain IT-enabled performance.

[1] We acknowledge that most modern organizations have enabled their business processes using IT. However, this does not mean that this enablement is, from a socio-technical approach, the best "fit" between the processes and the technology; instead, misalignment can still occur.

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This paper is organized as follows. We first provide a broad overview of our theoretical background based on complementary bodies of research. We then introduce our theoretical model based on two complementary views of IT-driven business value: IT-enabled business-processes and IT-business alignment. After this, we will present our research study, followed by results and conclusions.

II. THEORETICAL BACKGROUND

IT Investment Value: Beyond the IT Paradox

Over the past two decades, the issue of deriving value from IT investment has been the focus of an abundant body of research that includes articles, editorials, and books. The interest on this issue has not decreased, and the mixed results have led to an important debate on the so-called *IT productivity paradox* [Brynjolfsson 1993; Brynjolfsson and Hitt 1996]. Among this body of research, a multitude of research perspectives have been employed, utilizing diverse methodologies (quantitative/qualitative), levels of analysis (economy level, industry level, firm level), variables, durations, and examined contexts [Devaraj and Kohli 2003]. While many of the prior studies have contributed to confirm the IT paradox (specifically at the economy level [Baily 1986; Roach and Stanley 1987; Jorgenson and Stiroh 1995] and the industry level [Berndt and Morrison 1992], a majority of recent research has focused on the firm level.

The IT investment literature has focused on understanding how firm-level investments in IT leads to IT-driven business success [e.g. Mahmood and Mann 1993; Barua et al. 1995; Brynjolfsson and Hitt 1996; Cline and Guynes 2001; Davern and Kauffman 2000; Lee and Menon 2000; Quan et al. 2003; Osei-Bryson and Ko 2004]. Recently, attention has shifted toward broadening our understanding of the conditions under which IT produces organizational impacts [Brynjolfsson and Hitt 2000]. Yet, despite the vast amount of literature focused on investment, academic research remains unable to fully understand the mechanisms that link IT investment to organizational performance.

After reviewing the literature on IT investments, Devaraj and Kohli [2003] concluded that “the more detailed the level of analysis, the better the chance to detect the impact, if any, of a given technology” (p. 275). Furthermore, they noted that many IT payoff studies struggle in one (or more) of four areas: (a) small or not representative sample data; (b) cross-sectional data analysis that limits the ability to examine lag effects between IT adoption and organizational performance; (c) absence or limited use of control variables; and (d) aggregated units of analysis making difficult the examination of the impact of organizational initiatives. However, the four limitations noted by Devaraj and Kohli [2003] are not the only explanations offered for the productivity paradox. For example, Bakos [1998] suggests that other explanations include mismeasurement of the concepts from the IT investment literature, the lagged effect of IT impacts due to learning and adjustment, capital stock theory, and mismanagement. Finally, Brynjolfsson [1993] suggests that the redistribution and dissipation of profits could also provide an explanation.

Despite all the limitations cited within the literature, theoretically, IT-value literature has rested on a variance-based, production function approach to understanding the relationship between investment and performance. This approach, derived from microeconomics, attempts to relate input variables (IT-related) to output variables (performance-related); it assumes the existence of a direct causal effect between input and output variables. This assumption is exemplified in the selection of dependent variables, e.g., accounting-based and market-based performance criteria [Lee and Bose 2002], financial performance criteria [Weill 1992; Andersen and Segars 2001], Tobin’s q [Bharadwaj et al. 1999], productivity measures [Loveman 1994], and efficiency measures [Lee and Menon 2000 and Born 2002].

Nonetheless, researchers have recently begun to discuss the problems with utilizing a variance-based, regression approach to IT investment [e.g., Brynjolfsson and Hitt 2000 and Quan et al. 2003], and have suggested that research on investment needs to shift from variance-based to process-oriented models [Chen et al. 2006; Davern and Kauffman 2000; Lee and Menon 2000; Tallon et al. 2000]. In an attempt to move in this direction, contextual factors have recently been integrated as moderating or control variables in causal or process-oriented assessment models. Recent work has discovered the following:

- The firm’s external environment, strategic orientation, and CIO/CEO relationship influence the business value of IT investment [Li and Ye 1999]
- Information intensity is a moderating variable of the information systems infrastructure on business effectiveness [Born 2002]
- The interaction term of IT and strategic direction (considered as a moderating variable) contributes to financial performance [Shin 2006]

Yet, in our view, the focus on process-based models has not been extensive enough to allow us to fully overcome the productivity paradox. It is our suggestion that by broadening our theories to better account for process, we will improve our ability to observe the "lag effect" of investment—that is the time lag between investment in IT and its impact on performance. We are not the first to suggest that the lag effect is important to understand—previous work has examined the lag effect over an extensive period and concluded that IT investment is related to firm-level performance, yet a two-year lag is required to perceive the effect [Cline and Guynes 2001]. Similarly, other research has found that on average IT capital shows a positive impact on the sixth year after the spending and lasts for only two years and by the eighth year, the impact of the IT investment is not significantly different from zero [Yaylacicegi and Menon 2004].

Limitations of the IT Investment Value Perspective

Our review of the literature on IT value has outlined the difficulties of previous work in discovering the relationship between investment in IT and the achievement of a measurable outcome. Some of these limitations have been pointed out by [Oh and Pinsonneault 2007]. It is our view that in order to understand how IT impacts the organization, a process oriented view of the firm is needed, and we must take into consideration the specific outcomes of the investments—i.e., the resources and the capabilities generated as a result of investments. It is our thesis that investment in IT generates certain resources that are then reconstituted within capabilities, and it is these capabilities that drive organizational performance rather than the mere investment itself. Further, it is our view that the executives in charge of making these investment choices (IT and business executives) must align their investment choices with one another in order for IT enabled organizational performance to be achieved. Thus, to better understand the impact of IT investments, we must understand capabilities, specifically the business-process orientation and IT-business strategic alignment.

We propose the high-level theoretical framework presented in Figure 1. Specifically, we propose that IT investment is enacted in the technology resources deployed by the organization. However, as we will argue in the following section, the technology itself does not lead to organizational performance. Rather, the technology resources lead to the development of IT-enabled business processes, which in turn enables organizational performance. In addition to IT-enabled business processes, IT investment is reflected by IT-business alignment. And, based upon prior research on alignment, we suggest that alignment leads to organization performance.

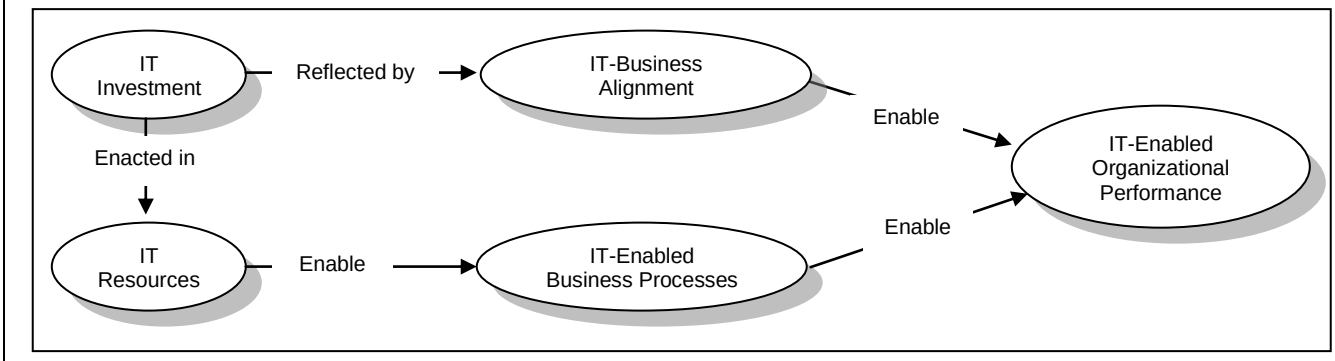

Figure 1: High-Level Theoretical Framework.

Our theoretical framework relies on a distinction between enactment and reflection. We view enactment as the product resulting from a decision to invest in the desired outcome. Therefore, we are interested in understanding the investment choices made by IT executives and view this as a proxy for understanding IT investments. We suggest that executives make decisions about how to invest the organization's time and money to produce certain outcomes. Thus, by analyzing the resources that the IT executives choose to invest in, we, in essence, can understand the alignment perspective of executive IT investment.

On the other hand, reflection is the manifestation of the investments through an aligned IT and business organization. Thus, we suggest that alignment is a reflective proxy that aids us in understanding investment choices. As our literature review has suggested, the research on IT investment has been inconclusive. In this paper, we will not study the direct impact of IT investment on organizational performance, but rather we seek to understand how the investment is enacted in firms—specifically how IT investments enhance the business process orientation of the

firm. We suggest this relationship is analogous to a structural equation model where we are measuring the indicators of investment rather than the overall construct.

Resource-Based Theory

The Resource-Based Theory (RBT) of the firm [Penrose 1959] proposes that the primary objective of a firm is to exploit and develop resources to maximize long-term profits. RBT is built on three key concepts: firm resources, competitive advantage, and sustained competitive advantage. The essence of the theory is that information technology *can* be a source of sustained competitive advantage, as long as IT enables the company to create a resource that is of value, rare, imperfectly imitability, and non-substitutabile [Barney 1991]. Prior work has found that possible IT-enabled sources of competitive advantage include access to capital, proprietary technology, technical IT skills and managerial IT skills [Mata et al. 1995].

The use of RBT to understand IT-enabled organizational performance is not necessarily new, although it is an understudied theory in our discipline (we point our readers to Wade and Hulland [2004] for a review of how RBT has been underutilized in the IS discipline). One is the work of Ravichandran and Lertwongsatien, who utilized RBT to understand how resources investment leads to performance [2005]. However, as we pointed out in the literature review, we would expect to see a lag effect, where resources may not only influence performance in the first year, but also in subsequent years. Further, we must also define what is meant by IT-enabled organization performance (a theme we will discuss later). Therefore, while prior research has utilized RBT (thus providing a justification for its' use), we would suggest that a broader utilization of the theory that overcomes the limitations discernible in the investment literature is necessary in order to increase our understanding of the organizational impact of IT investment.

We are not the first to argue that RBT can provide insight into the source of advantage for IT. In a recent review Melville suggested that RBT is a robust framework for analyzing whether and how IT may be associated with competitive advantage [Melville et al. 2004]. The authors conclude that "a limitation of the conventional resource-based view is that it assumes that resources are always applied in their best uses, saying little about how this is done. In effect, the RBT provides a set of necessary conditions to the attainment of sustainable competitive advantage via a firm resource, but does not specify the underlying mechanisms by which this is accomplished" (p. 291). Nonetheless, despite the potential for RBT in enabling us to understand the role of IT in competitive advantage, the approach has also been criticized for its rather static resource picking perspective [Mahoney and Pandian 1992 and Makadok 2001], hence the creation of the Dynamic Capabilities Theory (DCT). We will drawn on DCT to allow us to understand the mechanisms that lead to IT-enabled competitive advantage.

DCT rests on one key concept: dynamic capabilities. Dynamic capabilities are defined as "the ability to integrate, build, and reconfigure internal and external competencies to address rapidly-changing environments" [Teece et al. 1997]. In other words, dynamic capabilities are the ability of the firm to maintain their flexibility by creating competencies to address external pressure. According to DCT, firms do not mutually exclusively generate revenue from merely selecting *valuable* resources; instead, it is the interaction of resource-picking and capability-building that is the main source of competitive advantage [Makadok 2001]. However, prior work has suggested that capabilities can be thought of as intermediate goods to enhance the productivity of a firm's resources and lead to strategic flexibility [Amit and Schoemaker 1993] and that dynamic capabilities differ from resources in two ways: (1) a capability is always firm-specific, since it is embedded in the firm's structure and processes, and (2) the primary purpose of a capability is to enhance the productivity of other resources [Makadok 2001].

In this paper, we are interested in two specific capabilities: (1) Business processes and (2) IT-strategic alignment. We will draw our conceptualizations of these capabilities from prior work, using DCT as our theoretical basis. Based on this conceptualization, we will present our research model and discuss the empirical investigation.

IT-Enabled Business Processes: A DCT Perspective

Dynamic capabilities are defined as "the ability to integrate, build, and reconfigure internal and external competencies to address rapidly-changing environments" [Teece et al. 1997]. Conceptually, *dynamic capabilities* refers to the ability of the firm to recreate and execute innovation options to achieve a competitive advantage [Wheeler 2003]. While these options must continuously be evaluated and reconstituted in order to meet the criteria of dynamic, underlying the execution is a process within the organization. As Eisenhardt and Martin [2000] explain, dynamic capabilities are:

> *[firm] processes that use resources—specifically the processes to integrate, reconfigure, gain, and release resources—to match and even create market change . . . [T]hey are organizational routines through which firms achieve new resource configurations* [Eisenhardt and Martin 2000, p. 1107].

Extending this argument, we posit that business processes are the organizational routines through which the resources are configured. This conceptualization is not only theoretically consistent with DCT but is in keeping with the historical view of business processes.

We define a business process as "the specific ordering of work activities across time and space, with a beginning, an end and clearly identified inputs and outputs" [Davenport 1993]. Our focus in this work is not on business processes, per se, but on IT-enabled business processes. More specifically, we argue that the *enactment* of IT resources within the business processes (in a sense that they support the business process orientation of the firm) is the missing link relating IT investment to organizational performance.

To support the dynamic and changing business environment most firms face, IT has to be strategically flexible enough to cope with uncertain changes and tactically flexible enough to realize optimization potential in the business process by modifying IT and/or process specifications [Duncan 1995]. IT plays a vital role in ensuring this ability to readjust and reconfigure. Evans underlines that "the overarching issue underlying any application of the principle of flexibility is the aligned development of assets and capabilities in pursuit of dynamic objectives derived from evolutionary policy goals" [Evans 1991].

Therefore, we define IT-enabled business processes as *the extent to which IT enables "the specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs"* [Davenport, 1993, p. 5]. A necessary condition of these business processes is the technological resources needed to support the ordering of the activities. In other words, prior to the IT-enabled business processes, technological resources must be implemented within the firm to execute this ordering of steps. Therefore, theoretically, we argue that the availability of technological resources, or *business applications that use the global IT infrastructure* [Broadbent and Weill 1997], leads to the creation of IT-enabled business processes. Without these technological resources, the ordering of work activities could not be accomplished.

While technological resources are an antecedent to IT-enabled business processes, we argue that IT-enabled business processes in themselves do not lead to organizational performance, but that the efficiency gains through the processes leads to performance. Based on Melville et al [2004], we define business process performance as the *operational efficiency of business processes* [Melville et al. 2004]. Specifically, we hypothesize that the enablement of business processes with IT will lead to operational efficiency will be achieved. We have depicted our DCT-based view of IT-enabled business processes below in Figure 2.

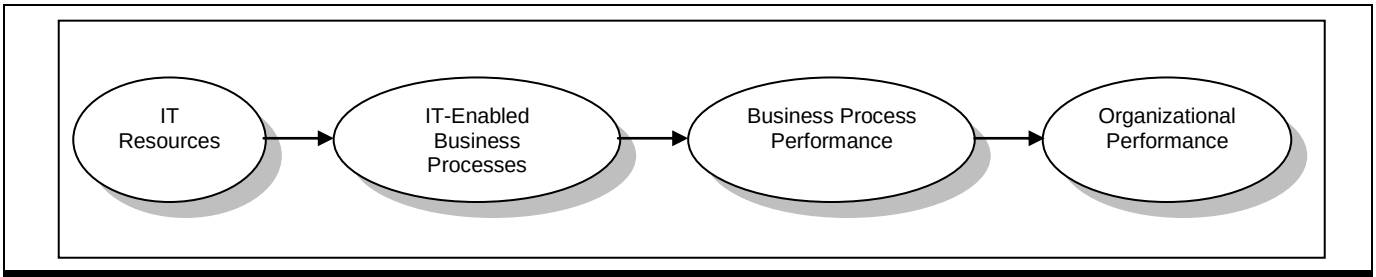

Figure 2: DCT Model of IT-Enabled Organizational Performance.

Our DCT-based view of IT-enabled business processes is consistent with current thinking in the area of IS capabilities. The DCT argument is based on our fundamental assumption that the competitiveness of a firm lies in the ability of the firm to leverage these IT-enabled processes. In other words, the presence of the resources alone does not lead to the performance gain; rather, the leveraging of these resources drives performance. As Peppard and Ward [2004] argue in their discussion of IT capabilities, "taking advantage of all that technology offers requires an enduring ability within an organization to understand how systems and information use can and does improve its performance" [Peppard and Ward 2004, p. 189]. We agree and argue that the DCT-based view of IT-enabled business processes extends and validates the capabilities approach.

Strategic Alignment: A DCT Perspective

The concept of strategic alignment between IT and business strategies is a recurring theme in the IS literature. Chan and Reich [2007] have provided an extensive review of the IT alignment literature, in which they address questions such as: What have we learned? And what are the new perspectives on alignment? Our paper echoes their claim for more acute theoretical developments and empirical testing.

Especially, according to RBT, alignment can be viewed as a complementary resource. However, as Wade and Hulland [2004] argue, "while the RBT recognizes the role of resource complementarity, it is not well developed in the theory." Accordingly, we will follow Makadok [2001] to combine the resource-based and capability building perspectives and treat alignment as a firm-specific capability, fostering resource complementarity between IT and business resources. In other words, alignment is the ability of the firm to align IT resources and business resources within a strategic framework to achieve organizational advantage.

Throughout the academic work on IT and business alignment, there have been several distinctions made regarding the nature of alignment. For instance, there has been a distinction made between the concepts of IS *strategic* alignment and IS *structural* alignment [Chan 2002; Henderson and Venkatraman 1992; Henderson et al. 1996]. IS *strategic* alignment generally focuses on the relationship between the firm's IS strategy and the business strategy [Chan et al. 1997a; Sabherwal et al. 2001]. In contrast, IS *structural* alignment focuses on the relationship between the business and IS structures within the organization [Ein-Dor and Segev 1982; Sabherwal and Chan 2001].

In addition, multiple frameworks have been proposed to understand IT-business alignment [Henderson and Venkatraman 1992; Henderson and Venkatraman 1993; Papp et al. 1995; Reich and Benbasat 1996]. Despite the differences over conceptualization, there does appear to be a consensus among academicians as well as practitioners [Luftman and McLean 2004] that the alignment between business strategy and IT strategy is a necessary prerequisite for companies to realize benefits from IT investments. However, little empirical evidence confirms the relationship between alignment and performance, with only a few studies operationalizing the strategic alignment concept to demonstrate the link between alignment and performance [Croteau et al. 2001; Grant 2003; Kefi and Kalika 2005].

One of the debates within alignment research has been the level of analysis—that is, what level of alignment matters. For example, the Henderson and Venkatraman model [1993] proposes alignment at both the strategic and functional levels, perspectives which were integrated into recent models [Maes 1999; Maes et al. 2000; Avison et al. 2004]. As Tallon suggests, organizations are dual focused in their attention to both operational efficiency and using IS as a mechanism for competitive advantage [Tallon et al. 2000]. This, therefore, implies the dual-level conceptualizations of strategic alignment. However, the linkages between these two levels remain vague and understudied. Therefore, we have selected to focus on the strategic level, as the strategic level of alignment has been called the central tenet of much of the theory and practice of IS strategy [Galliers and Newell 2003].

Specifically, to understand the nature of alignment, we have relied on using *fit* as a lens to discuss the implications of strategic alignment on organizational performance [drawing from Venkatraman 1989 and Van de Ven and Drazin 1985]. Venkatraman [1989] defines fit from six different perspectives: *matching, moderation, mediation, gestalts, co-variation, and profile deviation*. For our study, we will conceptualize alignment as a *perceived co-variation* and define *strategic alignment* as the extent to which top management is perceived to be committed to aligning IT and business strategy for competitive advantage. As such, we are suggesting that alignment is a reflection of investment; if top management is committed to aligning IT and business, this would reflect that the organization is interested in investing in IT. Moreover, according to the "intellectual dimension" [Reich and Benbasat 1996], effective strategic alignment is influenced not only by well-developed and blended business and IT strategies, but also on social constructs such as the level of (1) communication between business and IT executives and (2) connection between business and IT planning processes [Grant 2003]. Consistent with research, we will hypothesize that higher degrees of alignment will lead to organization performance. Further, we will also theorize that there will be differential impacts depending on the year in which performance is measured—i.e., there will be a lag effect in our understanding of alignment.

III. RESEARCH STUDY

Research Model

Relying on DCT, we have argued that business processes and IT-strategic alignment are dynamic capabilities. We have argued that each independently leads to organizational performance, albeit through different mechanisms. In Figure 3, we present our proposed research model. We point out that our view of organizational performance has two components—the strategic impact of IT (which we view as the long-term growth of the firm) and the operational impact of IT (which we view as the day-to-day operations of the firm).[2] Further, as we are interested in lag effects,

[2] We base this dichotomy on Porter (1996), who argued that organizational performance is related to two foci—operational effectiveness (internal) and strategic effectiveness (external), which we have captured in our operational and strategic dimensions of firm success

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we will test this model by assessing each of the independent variables in year 1 and the strategic and operational impacts in both years 1 and 2.

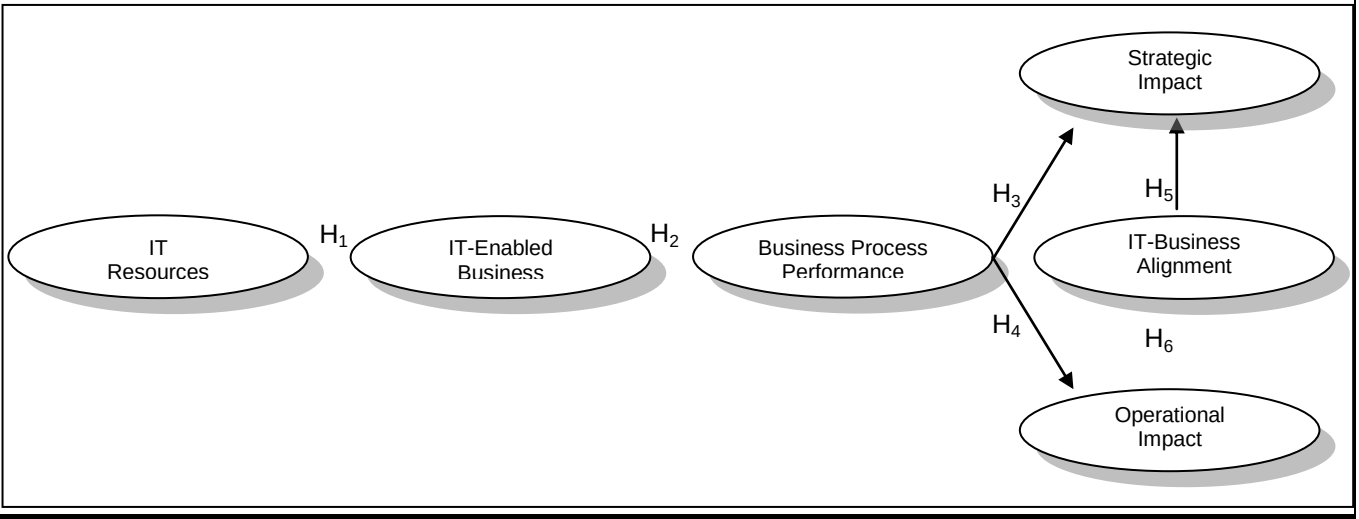

Figure 3: Initial Research Model.

Research Model and Hypotheses

With the research model as a backdrop, we propose six hypotheses. We will next articulate the theoretical logic, followed by an enumeration of the hypothesis. Each of our hypotheses derives from the aforementioned theoretical development and corresponds to Figure 3.

First, we suggest that a necessary condition for business processes to be IT-enabled is the technological resources needed to support the ordering of the activities. In other words, prior to the IT-enabled business processes, technological resources must be implemented within the firm to implement business process design. Therefore, we hypothesize that the *availability* of technological resources leads to the *creation* of IT-enabled business processes. We draw this assertion from DCT, which designates technology as one resource that enables dynamic configuration. Without the technological resources, the ordering of work activities could not be as efficient. However, the availability of resources itself does not necessarily predict that the processes will be IT-enabled; instead, it merely denotes that there is a greater likelihood of this occurring. This logic leads us to Hypothesis 1:

> *Hypothesis 1: Higher levels of investing in IT resources will lead to higher degrees of IT-enabled business processes.*

Our second hypothesis is that firms that IT-enable their business processes will achieve higher levels of business process performance than those that do not. As we have previously argued, capabilities can be thought of as intermediate goods to enhance the productivity of a firm's resources and lead to strategic flexibility [Amit and Schoemaker 1993]. Therefore, if IT-enabled business processes are conceptualized as dynamic capabilities, these capabilities will increase productivity. This logic leads us to Hypothesis 2:

> *Hypothesis 2: Higher levels of IT-enabled business processes will lead to greater business process performance.*

Our third hypothesis is that firms with higher levels of business process performance will see a direct impact on the ability of IT to make deep strategic changes to the organization. If the business process is viewed as a dynamic capability, the firm will be enabled to be able to pursue dynamic goals [Evans 1991] at a strategic level, yet this is dependent on the performance of the business processes. Specifically, through the introduction of IT and the corresponding performance gains, the flexibility and agility of the firm will be enabled (as the firm will be able to reconstitute and reconfigure the technology resources to be able to address changing market conditions) and the strategic changes that IT can enable will be realized. This logic leads us to Hypothesis 3:

> *Hypothesis 3: Higher levels of business process performance will strategically impact the firm.*

Just as business process performance will enable the firm to strategically reconfigure resources, we also hypothesize that the same will be true at the operational level. As a dynamic capability, the business process will

enable the firm to reconfigure resources at the operational level [Eisenhardt and Martin 2000] and, therefore, we argue, we will expect that the performance that derives from the IT-enabled business processes will lead to operational impacts. By enabling business process performance through IT, firms will see lower level gains in productivity and other corresponding operational impacts. This logic leads us to Hypothesis 4:

Hypothesis 4: Higher levels of business process performance will operationally impact the firm.

Our next hypothesis shifts from business processes to IT-business alignment. We hypothesize that alignment is a dynamic capability of the firm to create the resource-picking and capability-building strategies that generate a source of competitive advantage [Makadok 2001]. Therefore, we argue that alignment is the mechanism that enables the interaction between the resource-picking and capability building that leads to both strategic and operational impacts. We derive our strategic level impact argument from prior work that has demonstrated that a positive linkage exists between alignment and performance [Croteau et al. 2001; Grant 2003; Kefi and Kalika 2005]. While these studies differ from ours in the measurement of the final dependent variable (i.e., different conceptualizations of performance), our hypothesis stems from prior work that has suggested that aligning IT and business is strategically important [Luftman and McLean 2004]. This logic leads us to Hypothesis 5:

Hypothesis 5: Aligning IT and the business will strategically impact the firm.

Our final hypothesis is that IT and business alignment operationally impact firm operations. The support for this assertion is from Henderson and Venkatraman [1993], who suggested the need for alignment between IT strategy and organizational (i.e., operational) resources. We therefore extend the strategic alignment framework to assert that alignment will produce an operational-level impact on the firm. This logic leads us to Hypothesis 6:

Hypothesis 6: Aligning IT and the business will operationally impact the firm.

Measurement

Based on our literature review and the research model depicted in Figure 3, we first defined the constructs. The definitions of our constructs and their corresponding references are in Table 1. To translate the constructs into actual survey items, we decomposed each of the constructs using prior work referencing the construct to determine how to capture each of the constructs.

To assess the IT-enabled business process and its impacts in terms of business performance, we adapted the Jaworski and Kohli [1993] framework that has also been used and validated [McCormack 1999] to develop a measure of business-process orientation and its relationship to organizational performance [Jaworski and Kohli 1993]. The other components of our model have been operationalized according to theoretical definitions derived from prior work [Broadbent and Weill 1997; Tallon et al. 2000; Reich and Benbasat 1996; Porter 1996; Zott and Amit 2008]. Scales for each of the items were rated on a 5-point Likert scale (from 1—strongly disagree to 5—strongly agree).

Based upon our construct definitions and research items, we next analyzed whether the constructs should be specified as reflective or formative indicators. Our rationale for each construct is as follows:

- Technological Resources: We theorize that each of our three items would co-vary with one another—that investments would be similar across our resource items and, therefore, have, specified technological resources as a reflective construct.
- IT-enabled business process: We theorize that a firm that makes work procedures available online will also validate these processes using workflow systems and, therefore, have specified IT-enabled business process as a reflective construct.
- Business Process Performance: We theorize that one measure of operational efficiency will not translate into another—that anticipation capacity does not necessarily enable better coordination or information sharing and, therefore, have specified business process performance as a formative construct.
- IT-business alignment: We theorize that top management commitment does not translate into a perception that IT is a competitive advantage and, therefore, have specified IT-business alignment as a formative construct.
- Organizational Performance (Strategic): We theorize that the deep changes are synonymous with strategic changes and, therefore, have specified strategic performance as a reflective construct.
- Organizational Performance (Operational): We theorize that the five elements of operational success (productivity/cost control/innovation capacity/reactive capacity/customer expectations) would co-vary with one another and, therefore, have specified operational performance as a reflective construct.

Table 1: Constructs and Items in Research Model					
Construct	**Definition of Construct**	**Translation of Construct to Items**	**Items**	**Construct Nature; Justification[3] (Years Modeled)**	**Theoretical references**
Technological Resources	Business applications that use global IT infrastructure [Broadbent and Weill 1997]	Based on Tallon, Kramer et Gurbaxani 2000 and Tan, Gallupe, Diaz 2003, we are interested in understanding the business applications in the following areas: ♦ Process planning and support ♦ Supplier relations ♦ Functional operations ♦ Marketing/sales and customer relations We, therefore, defined technological resources to reflect the business applications	TIR1: A part of the purchases of the firm are made by e-procurement (measuring supplier relations) TIR2: Customers on line orders feeds directly the IS [measuring customer relations] TIR3: Count of the systems that the organization uses yes/no responses to if your firm has… ♦ An ERP (measuring process planning/support) ♦ CRM application (measuring customer relations) ♦ IS in HR Management (measuring functional operations) ♦ e-learning support system (measuring functional operations) ♦ Website (measuring marketing/sales) ♦ Intranet (measuring functional operations)	Reflective; We hypothe-size that these items to co-vary with one another as the degree of investment would vary similarly across all three items [2003]	Weill and Broadbent [1997]; Tallon, Kramer, and Gurbaxani [2000]; and Tan, Gallupe, and Diaz [2003]
IT-Enabled Business Process	The extent to which IT enables "the specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs" [Davenport 1993, p. 5]	Based on the definition, we measured the extent to which IT had created cross-functional, empowered organizational structures	ITEBP1: Work procedures are available online ITEBP2: The steps of our functional processes are systematically validated using workflow system	Reflective; We hypothe-size that the IT-enable-ment of procedures and steps would co-vary [2003]	Jaworski and Kohli [1993] and McCormack [1999]

[3] Our justification for our specification of formative versus reflective indicators derives from the third decision realm offered by Jarvis et al (2003) and summarized by Loch et al (2003) and Petter et al (2007).

Table 1: Constructs and Items in Research Model (continued)					
Construct	**Definition of Construct**	**Translation of Construct to Items**	**Items**	**Construct Nature; Justification[4] (Years Modeled)**	**Theoretical references**
Business Process Performance	Operational efficiency of business processes [Melville et al. 2004]	Based upon Melville et al [2004], we selected three of the four common measures of business process performance—flexibility (captured by the ability to coordinate), information sharing (captured directly), and inventory management (captured by anticipation capacity).	BPP1: IT generates better anticipation capacity to managers BPP2: IT generates better coordination between departments BPP3: Thanks to IT, information sharing is going better	Formative; We hypothesize that anticipation, coordination capabilities, and information sharing do not co-vary [2003]	Kohli and Jaworski [1993] and McCormack [1999]
IT-Business Alignment	Extent to which top management is committed to aligning IT and business strategy for competitive advantage [Fit as perceived co-variation, Venkatraman 1989]	As perceived co-variation, we are interested in the perception of the management to being committed to IT and using IT as a competitive advantage	ITALIGN1: Top management is committed to the strategic use of IS/IT ITALIGN2: IT constitutes a competitive advantage	Formative; We hypothesize that commitment to IT does not imply that IT will be constituted as a competitive advantage [2003]	Reich and Benbasat [2000] and Venkatraman [1989]
Organizational Performance	Overall firm performance, including productivity, efficiency, profitability, market value and competitive advantage [Melville et al. 2004].	We have divided organizational performance in to strategic and operational success and defined items related to the strategic and operational success of the firm [Porter 1996]	**Strategic Success** OPS1: IT has generated strategic changes OPS2: The introduction of IT has generated deep changes in organization of the firm	Reflective; We hypothesize that the view towards the strategic and deep changes would co-vary [2003 and 2004]	Melville et al. [2004] Porter [1996]
			Operational Success OPO1: Thanks to IT, individual productivity is better OPO2: Thanks to IT, cost control is better OPO3: Thanks to IT, innovation capacity is better OPO4: Thanks to IT, reactive capacity is better OPO5: Thanks to IT, customer expectations is better	Reflective; We hypothesize that the elements of success that we have enumerated would co-vary [2003 and 2004]	

[4] Our justification for our specification of formative versus reflective indicators derives from the third decision realm offered by Jarvis et al (2003) and summarized by Loch et al [2003] and Petter et al [2007].

Data Collection

To collect data to test our research model, we used data from a database constructed by a research center at the university of one of the authors to assess IT–related issues in European companies. The survey is conducted in French once a year in randomly selected European firms, with 500 questionnaires being collected each year (the original instrument is included in the Appendix). We targeted either the CEO or the CIO in the firm. 57 percent of the firms in our samples were represented by the CEO, while 43 percent of our respondents were CIO's. Given our need for longitudinal data, we needed to limit our data set to: (a) those companies that participated in two subsequent years and (b) those companies where the same individual completed the survey in both years. A total of forty-two firms participated in 2003 and 2004 and whose surveys were completed by the same individual. The characteristics of the firms in the study are in Tables 2, 3, and 4.

Table 2: Number of employees in firm

	0 to 500	500 to 10000
Number of employees	86%	14%

Table 3: Location of Firm Headquarters

	Only in France	In Europe	Different Continents
Location of firm	50%	31%	19%

Table 4: Sector of Firms

	Construction	Manufacturing	Retail	Hotel/ Restaurant	Transportation	Technology	Financial	Services	Others
Sectors	2%	36%	5%	2%	5%	5%	2%	38%	5%

IV. DATA ANALYSIS

In the proposed research model, each of the constructs is a latent variable. A latent variable is a variable that cannot be measured directly, but can be measured by linking it (the latent variable) to a set of items that can be measured directly. To analyze latent variables, a second-generation data analysis technique is needed that will allow us to link the items to their respective constructs and then connect the constructs in the network proposed in the theoretical model. The analysis technique selected was Structural Equation Modeling (SEM).

While many techniques of SEM abound, the two best known approaches are the co-variance-based methodology (found in software such as LISREL, AMOS, and EQS) and partial-least squares (found in software such as PLS-Graph). When choosing between these models, a researcher must examine assumptions of the normality of data, sample size, the nature of the indicators, and the objective of the research. While co-variance-based approaches require a normal distribution of data and a range of sample sizes of 200 to 800 (based on the power analysis of the model) [Chin 1998; Chin and Gopal 1995], PLS does not have the restrictions on normal data, and sample sizes can range from 30 to 100, depending on the model [Chin 1998; Gefen et al. 2000]. Second, co-variance-based approaches require reflective indicators only, while the PLS-based approach allows for reflective and formative indicators. Additionally, co-variance-based techniques are better suited for research testing, while the strength of PLS is its ability to understand and predict relationships when the objective is theory building. Given that the sample size for our data is small (forty-two respondents), the partial least squares approach was chosen. Using the "power of 10" rule (i.e., ten times the highest number of items loading on a given construct or ten times the highest number of paths leading to a given construct), the sample size required for a PLS analysis was forty [Goodhue et al. 2006]; thus, the power is adequate to analyze the data. Specifically, PLS-Graph (version 3.00, build 1126) software was selected and used.

To analyze the theoretical model, both the measurement and structural models were examined. The measurement model (also called the outer model) analyzes the relationships between the latent constructs and their associated items. Thus, analyzing the measurement model requires a researcher to examine how well the items that were created individually measure the construct that they were intended to reflect, then to observe how well the items individually measured relate to the other constructs in the model (that they were not intended to reflect). Following this analysis, all the items that were designed to measure each construct compositely were analyzed to determine how well they reflected the construct as a group. Finally, the group of items is measured to ensure that they (as a group) are adequately measuring the construct they were intended to reflect, instead of the unintended construct.

The analysis of the measurement model is followed by the analysis of the structural model. The structural model (also called the inner model) analyzes the relationships between the various latent variables. Consistent with such quantitative analysis, the latent constructs are linked to one another to determine the statistical strength of the relationship between the constructs and the predictive power of these links. The results of this analysis are as follows. To estimate the significance of the path coefficients, we used bootstrapping with a sample size of 100, as recommended by Chin [1998].

Finally, we have included a control variable of firm size in our analysis to ensure that the findings could not be explained as a function of organizational resources (or lack thereof). Firm size was not a predictor of strategic or operational impacts and will not be included in our structural model results. However, firm size has been included in our presentation of the measurement model.

Measurement Model

The first step in examining the measurement model is to examine the adequacy of the measures. By examining the individual item reliabilities, represented by the loadings to their respective construct, we will ensure that the items are measuring the constructs as they were designed. As Chin [1998] states, "standardized loadings should be greater than 0.707." Further, Barclay et al. [1995] state that when scales developed for a particular research context are used in a different context, the items may exhibit low loadings. Nonetheless, these guidelines are important only to note for reflective items. For formative items, the significance of these items (using a bootstrap of 100) is necessary to determine whether the weight is appropriate. Based on this analysis, two items were removed—TIR3 from Technological Resources and OPO1 from 2003 and 2004 operational impacts. Table 5 presents the item loadings and weights obtained from the research model.

Table 5: Factor Loadings and Weights for Research Model

Variable	Weight	Loading
Technological IT Resources		
TIR1	0.441	0.740
TIR2	0.736	0.915
IT-Enabled Business Performance		
ITEBP1	0.550	0.855
ITEBP2	0.602	0.880
Business Process Performance		
BPP1	0.690	0.913
BPP2	0.466	0.796
IT-Business Alignment		
ITALIGN1	0.833	0.948
ITALIGN2	0.339	0.621

Variable	Weight	Loading
2003 Strategic Impacts		
03OPS1	0.744	0.886
03OPS2	0.486	0.703
2004 Strategic Impacts		
04OPS1	0.577	0.916
04OPS2	0.525	0.898
2003 Operational Impacts		
03OPO2	0.272	0.714
03OPO3	0.401	0.883
03OPO4	0.279	0.815
03OPO5	0.288	0.778
2004 Operational Impacts		
04OPO2	0.265	0.851
04OPO3	0.342	0.839
04OPO4	0.250	0.8529
04OPO5	0.320	0.8583
Size		
Size	1.000	1.000

Examining the weights for each of the items, all of the reflective elements met the requirement as prescribed by Chin [1988] and all of the formative elements were significant, thus indicating that the measures were adequate in their validity individually. **Yet**, this does not indicate if the items were able to load only on the construct for which they are intended.

To determine whether the items loaded on other constructs as well as on their theorized construct, cross-loadings were computed (presented in Table 6). The criteria for cross-validated items to be included in the finalized data set, the loading must be larger on the intended construct than any other constructs. From this analysis, the items to be used in the subsequent analyses were finalized.

Table 6: Loading and Cross-Loadings for Reflective Constructs in Research Model							
	Technological IT Resources	IT-Enabled Business Performance	2003 Strategic Impacts	2004 Strategic Impacts	2003 Operational Impacts	2004 Operational Impacts	Size
TIR1	**.740**	.268	.306	.239	.354	.480	.451
TIR2	**.915**	.447	.216	.125	.270	.317	.640
ITEBP1	.389	**.855**	.014	-.030	.348	.161	.334
ITEBP2	.387	**.880**	.240	.091	.383	.416	.400
03OPS1	.205	.087	**.886**	.467	.462	.114	.089
03OPS2	.292	.179	**.703**	.582	.353	.274	.025
04OPS1	.276	.050	.525	**.916**	.444	.427	.158
04OPS2	.073	.018	.622	**.898**	.422	.272	-.019
03OPO2	.424	.432	.397	.317	**.714**	.384	.171
03OPO3	.332	.310	.454	.445	**.883**	.452	.168
03OPO4	.204	.442	.417	.359	**.814**	.327	.224
03OPO5	.171	.195	.377	.390	**.778**	.312	.115
04OPO2	.312	.276	.056	.245	.397	**.851**	.208
04OPO3	.414	.457	.246	.279	.370	**.839**	.357
04OPO4	.366	.180	.109	.375	.308	**.853**	.301
04OPO5	.402	.202	.286	.424	.494	**.858**	.159
Size	.670	.425	.078	.081	.210	.303	**1**

Using the loadings from the constructs in Table 5, composite reliabilities were created for the constructs in the research model. Table 7 below shows the number of items in each scale and the composite reliabilities for each construct. The results indicate that all of the constructs (except 2003 strategic impacts) met the recommended value of 0.80 and thus are reliable.

Finally, as a means of evaluating discriminant validity, the average variance extracted for each construct should be greater than the squares of the correlations between the construct and all other constructs [Fornell and Larcker 1981]. Equivalently, we would want to find the correlations between the constructs lower than the square root of the average variance extracted. In Table 7 below, all of the average variance extracted (AVE) are greater than the recommended 0.50 level and the square root of the average variance extracted (on the diagonal, in bold) is greater then the correlations between the constructs.

Table 7: Composite Reliability and Correlations Among Reflective Latent Constructs										
	Number of items	Composite Reliability	AVE	IT-Enabled Business Performance	2003 Strategic Impacts	2003 Operational Impacts	2004 Strategic Impacts	2004 Operational Impacts	Technological IT Resources	Size
IT-Enabled Business Performance	2	0.859	0.753	0.868						
2003 Strategic Impacts	2	0.778	0.639	0.152	0.799					
2003 Operational Impacts	4	0.876	0.639	0.422	0.515	0.799				
2004 Strategic Impacts	2	0.903	0.823	0.038	0.630	0.478	0.907			
2004 Operational Impacts	4	0.913	0.723	0.339	0.218	0.467	0.389	0.850		
Technological IT Resources	2	0.817	0.693	0.447	0.294	0.355	0.197	0.445	0.832	
Size	1	1.000	1.000	0.425	0.078	0.210	0.081	0.303	0.670	1.000

While the aforementioned approach is appropriate for reflective items, the same method cannot be used to validate formative items. Alternative, following the methodology proposed by Loch et al [2003], we relied upon this approach to validate our formative items. Since our scales were normalized, we began by multiplying the values for our formative items by their individual PLS weights and summed them up for each construct. Using these values, we were able to run inter-item and item-to-construct correlations among our formative indicators. In addition to our formative indicators, we also included the "size" construct for the sake of comparison. The correlation matrix is included below in Table 8.

To examine the validity of the formative items, we first analyzed if the inter-item and item-to-construct correlations were significant. All correlations were significant at the $p < 0.05$ level, thus providing evidence for the convergent validity of the instrument. To test for discriminant validity, the inter-item and item-to-construct should correlate more highly with each other than with the measures of other constructs, and, in our case, with the composite constructs themselves. All of the items and constructs met this criterion and provide evidence for the discriminant validity of the instrument. We also included the variable of organization size for the sake of comparison and contrast. Taken together, these analyses provide evidence of the validity of our formative items.

Table 8: Inter-Item and Inter-Correlation Among Formative Latent Constructs

	Size	BPP1	BPP2	ITALIGN1	ITALIGN2	BPP	ALIGN
Size	1						
BPP1	-.157	1					
BPP2	-.031	.478**	1				
ITALIGN1	-.332*	.465**	.383*	1			
ITALIGN2	-.277	.337*	.327*	.338*	1		
BPP	-.130	.937**	.755**	.499**	.382*	1	
ALIGN	-.366*	.499**	.425**	.965**	.574**	.541**	1

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Assessing Common Method Bias

In order to detect the presence of a common method effect, two post hoc analyses were conducted. First, Harman's one-factor test was performed. The objective of Harman's one-factor test is to determine if either (a) a single factor will emerge from the factor analysis or (b) if one factor will explain a majority of the co-variance of the variables [Podsakoff et al. 2003]. All of the variables were entered into an exploratory factor analysis, using unrotated principal components factor analysis and principal component analysis with varimax rotation. The two approaches did not reveal that a single factor explained a majority of the total variance (Unrotated principal component analysis: 31 percent, with five factors containing an eigenvalue over 1 and principal component analysis with varimax: 21 percent, with five factors containing an eigenvalue over 1). The results from this analysis showed that the single-factor model did not fit the data well, thus suggesting that common method variance is not likely to confound our results.

As a second step, we conducted a test of common method bias using the marker variable approach. Since no *a priori* marker variable was defined prior to data collection, it was estimated using the second smallest correlation among the manifest variables [Lindell and Whitney 2001]. We adjusted the correlation matrix to partial out the effects of method variance [Malhotra et al. 2006] and then tested the significance of the correlations within the adjusted matrix. The correlations that had been significant prior to the adjustment were also significant following the adjustment, while the non-significant correlations remained non-significant. The results from this analysis suggests that common method variance is not likely to confound our results.

Structural Model Results

With the measurement model analyzed, the next step was to create a structural model, presented below in Figure 4.

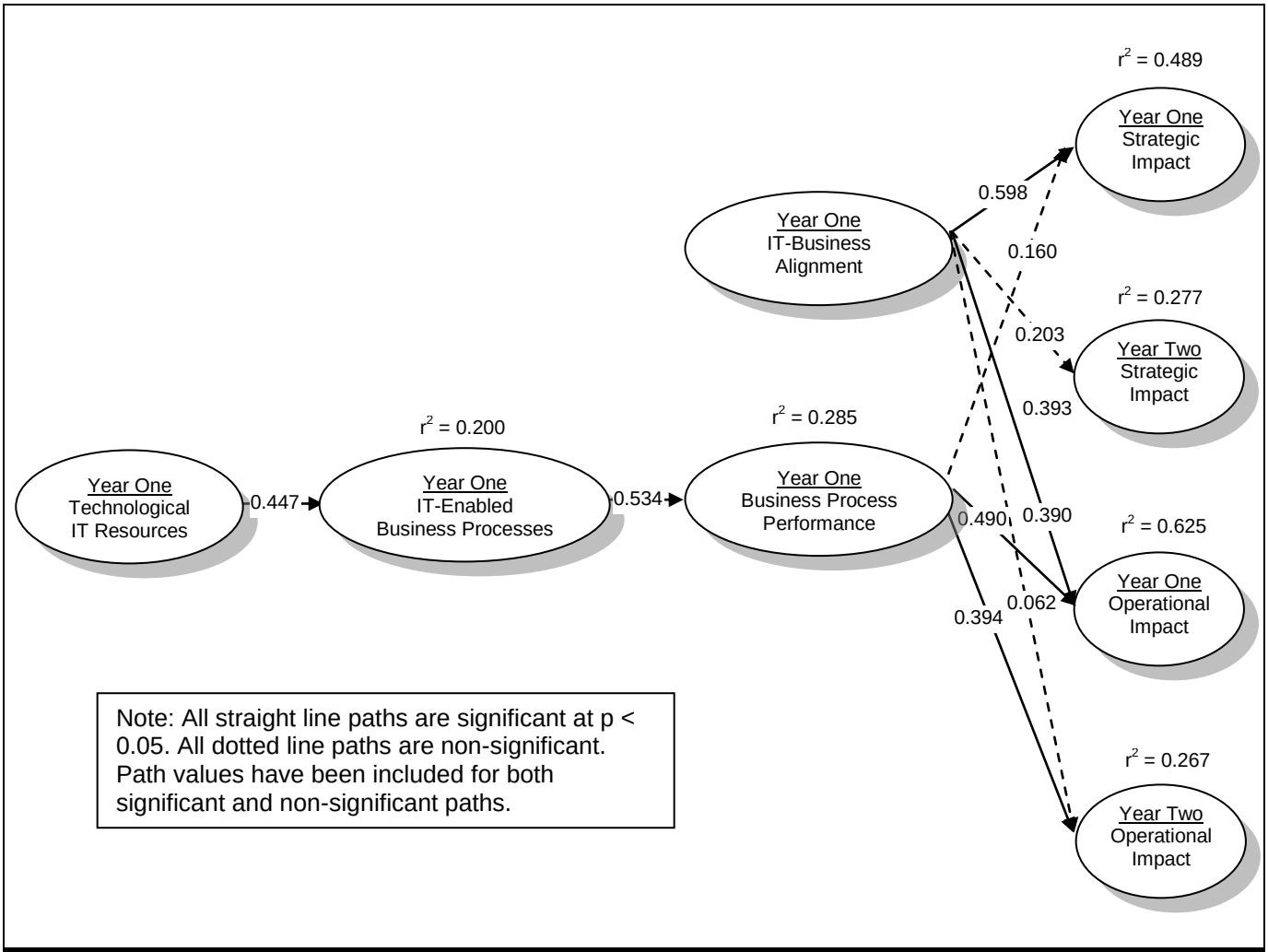

Figure 4: Structural Model Results.

The results indicate that the greater the degree of technological resources, the higher the amount of IT-enabled business processes (0.447, r^2 = 0.200). This finding confirms Hypothesis 1—higher levels of investing in IT resources does lead to higher degrees of IT-enabled business processes. Next, the results further demonstrate that the greater the degree of IT-enabled business processes, the higher the business process performance (0.534, r^2 = 0.285). This finding confirms Hypothesis 2—higher levels of IT-enabled business processes does lead to greater business process performance.

In year 1, business process performance has an operational (0.490), but not a strategic impact. In contrast, in year 2, business process performance has both an operational (0.394) and a strategic (0.393) impact. This finding confirms Hypotheses 3 and 4.

Finally, the results indicate that strategic alignment has an impact on strategic (0.598) and operational performance (0.390) in year 1. However, there is no significant impact of alignment on organizational performance in year 2 (neither strategic, nor operational). This results confirms Hypotheses 5 and 6, however, raises some questions about the lag effect of alignment—a theme that we will address next, during our discussion.

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V. DISCUSSION

From a conceptual perspective, the empirical support for the model attests to the pertinence of approaching the link between IT investment and performance by analyzing the way that the firm structures its business processes and the perceived alignment. The use of a process model which focuses on IT resources, IT-enabled business processes, business process performance and IT alignment provides strong results regarding the impact of these phenomenon on each other. In fact, by employing triangulation of theories [Denzin 1978], we are better able to view organizational performance utilizing multiple lenses. Both the RBT and the IT-business alignment perspectives yield empirically strong results. From the RBT perspective, our results validate the link between IT resources and organizational performance. Additionally, the IT-business alignment perspective demonstrated the impact of alignment on performance. Empirically the two theoretical approaches are not in contradiction.

Our results demonstrate the benefits of combining these two approaches, the dynamic capabilities view and the understanding of IT-business alignment, which are often considered to be in opposition. Based on our findings, we should not consider these two approaches in opposition; instead, we should view them as complementing each other. Indeed, according to Barney [1991], resources include capabilities and organizational processes, while IT-business alignment has been defined as the extent to which top management is committed to aligning IT and business strategy. Considering the practice of strategic alignment, we can propose that strategic alignment would also be a capability, precisely the capability to associate different capacities, those of strategy and those of IT. Therefore, the two perspectives are not as disparate as frequently presented. Our results permit the reconsideration of the proximity of the two frequently opposed perspectives.

As the marketplace becomes more competitive, organizations cannot rely upon IT-business alignment or IT-enabled business processes alone. Instead, this research demonstrates the importance of both of these improvements on organizational performance. Since the impact of IT on organizational performance can often become difficult to measure, these areas represent critical areas where IT can quantify its worth to the organization. By focusing on these two areas, IT can prove its value to the bottom line.

Implications for Research

Contrary to what is expected, the lagged effect of IT-business alignment on organizational performance was not displayed in our results. Instead, the impact of alignment seems to be immediate and dissipates in the long-term. The explanation of these results can be found in the rapidity of change and the intensity of competition in various sectors that oblige companies to immediate and rapid adaptations. We suggest that alignment is temporally bound and an attempt to examine the lag effect of this concept may not be as meaningful as examining business processes.

On the other hand, the impact of business process performance on organizational performance is immediate on the operational and the strategic sides. From year 1 to year 2, the operational impact decreases significantly, while the strategic impact strengthens. We postulate that this shift is due to organizational learning, namely that the organization learns how to perform better relying on the IT-enabled processes and that these changes alter the long-term strategic thinking. In other words, as the positive impacts of the changes become visible in the organization, managers may decide to implement deeper strategic changes in subsequent years, which could lead to increased organizational performance in the future.

While alignment has long been argued as having profound strategic implications for the firm, our findings indicate that a focus on alignment merely at the strategic level does not result in the deep and profound impacts which are achieved with a focus on both the operational and strategic levels. IT must enable multiple levels within the firm, which can be achieved by empowering managers with IT. This, therefore, provides a research question on the nature of alignment—should alignment continue to be conceived as important only at the strategic level, or shall this concept be broadened to include multiple levels within the firm?

Moreover, this study contributes to research on the productivity paradox. We have contributed to understanding the impact of IT investment on organizational performance by incorporating mediators. Thus, we are able to better understand how a corporation's investment in IT influences their performance. By analyzing the dispersion process of the IT investment in more detail, we can better track the impact of the funds to determine its influence on the organization.

Further, by incorporating the level of analysis into the study, we can better detect the specific impact of investment in IT on organizational performance. By expanding our understanding of IT investment to include enactment and reflection, we are able to understand the instantiation of investments rather than the amount, per se. This level of granularity will allow researchers to understand the "how" of investment—in other words, "how" investment achieves

outcomes. In our study, we have suggested that business processes and alignment are two ways in which this occurs. However, we will acknowledge that other alternatives may exist and, thus, we encourage researchers to find alternative avenues to explore how investment is enacted and reflected in order to further explore the productivity paradox.

For alignment research, these results indicate that there is a temporal bound to the concept and that there is a dynamic nature—i.e., it cannot be assumed that alignment in one year will lead to alignment in the next, nor does it mean that alignment in one year will lead to further organization success. While we have utilized perceived co-variation in our study, we encourage researchers to explore the extent to which other forms of alignment are temporally bound as well.

For business process research, these results indicate that IT-enabled business processes have the strongest power in explaining operational and strategic success. While we have utilized DCT in our study, other theoretical lenses can be used to understand the impact of business processes (e.g., transaction costs or knowledge integration), and we encourage researchers to begin exploring alternative theoretical frames to examine business processes.

Implications for Practice

Our findings have implications for our colleagues-in-practice. First, our findings that alignment is temporally bound suggest that alignment in one year will not translate into having an organizational impact in another. For our colleagues, this means that ensuring IT-business alignment must be a continuous process and is not a "one-time" event.

Our findings also highlight the power of alignment. The impact of alignment on the strategic direction of the firm was significantly higher than that of business process performance. For our colleagues-in-practice, our findings give further support to the need to ensure alignment for strategic growth of the firm.

Yet, while alignment was temporally bound, the same cannot be said for business process performance. Business process performance demonstrated a lag effect that alignment did not. While we would expect to see the lag effect for how enabling business processes impacts the operational level, the more interesting finding for our colleagues in practice is the impact of business process performance on the strategic impact in year 2. Our interpretation of these findings is that the business processes enable the firm to be flexible and, by extension, enable new strategic opportunities to emerge. Therefore, for our colleagues, our findings highlight the need to leverage business process performance for strategic gain and not yield to an operational-only view of business processes, as ensuring high levels of performance also impacts the strategic level of the firm.

Limitations

There are a few limitations inherent to any research. We will now review each of the limitations and briefly discuss each potential shortcoming. We propose that each limitation provides opportunity for future work to build on our findings.

First, the data was collected from one representative from each firm, which is subject to common method bias [Podsakoff et al. 2003]. The perspective of one individual in assessing these perceptual measures creates the potential for a bias (either positive or negative) in the assessment of the role of IT in the firm. Including multiple perspectives about the nature of alignment within the firm could provide broader insights into the multifaceted issue of alignment. We suggest that much alignment research could be characterized as derived from single-actor perspective, rather than from a multi-actor vantage point and that future work could approach alignment work from a collaborative, network view.

Second, we must note that the lag effect has been observed for only one year and, as pointed out in our literature review, research has suggested that the lag effect may show up over a longer period of time. While we concede that this limitation does not reveal the potential for future benefits that could be derived, our study has been among the first to empirically demonstrate the effect. We suggest that future researchers could build on our work and examine the lag effects over a broader number of years.

Third, we have conducted the study among European firms, thus providing a specified competitive landscape that may not be similar to other areas around the globe. We concede the opportunity for external market forces to impact IT investment and the corresponding investments in technology resources. The impact of these market forces could alter the perspectives of executives on the need to invest in IT, thus creating the potential for a change in our findings. We therefore suggest to other researchers the need to replicate our findings to examine the impacts of market forces on these findings.

Fourth, our sample consists of 81 percent small firms (i.e., firms of less than 500 employees); thus, there are questions about the generalizability of the findings to larger firms. The technology investment strategy and alignment issues differ across the size of the firm, and, therefore, there are potential limitations in extrapolating these results to larger firms. We encourage other researchers to examine different patterns of investment in alignment in SMEs versus their larger counterparts.

Finally, while the "power of 10" method of assessing sample size was used to justify our selection of PLS, this approach does not preclude us from concluding definitively that the non-significant paths do not exist [Goodhue et al. 2006]. However, this does not mean that our significant findings are due to chance, thus, even the small sample size yields an initial view into the relationships within our structural model. We urge additional research to uncover the lag effects of IT-enabled business process and IT-business alignment to provide us with a broader understanding of the impacts of these two important areas.

VI. CONCLUSIONS

In this paper, we proposed a theoretical model to understand the impact of IT-enabled business processes and IT-business alignment on the strategic and operational success of a firm, noting the lag effect of these two phenomena. Based on our theoretical model, we conducted an empirical study and found that alignment has temporal bounds, while IT-enabled business processes have broader effects. Thus, we conclude that the resolution of the productivity paradox lies not in our high-level understanding of the relationship between investment and outcome but on how investment is enacted and reflected in organizations.

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Editor's Note: The following reference list contains hyperlinks to world wide web pages. Readers who have the ability to access the web directly from their word processor or are reading the paper on the web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
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APPENDIX
ORIGINAL INSTRUMENT IN FRENCH

NOM de l'entreprise
Votre fonction:

Merci de répondre oui ou non ne sait pas à ces questions (1 à 6)

1. Votre entreprise dispose-t-elle des applications suivantes?

(q1) a a- Un progiciel de gestion intégré (ERP)	Oui	Non ☐ ne sait pas
(q1b) b- Une application de gestion de la relation client (CRM)	Oui	Non ☐ ne sait pas
(q1c) c- Un centre d'appels clients (interne ou externe)	Oui	Non ☐ ne sait pas
(q1d) d- Un système d'information ressources humaines (postes disponibles, compétences, carrières)	Oui	Non ☐ ne sait pas
(q1e) e- Formation en-ligne (e-learning)	Oui	Non ☐ ne sait pas
(q1f) f- Un ou plusieurs sites Internet	Oui	Non ☐ ne sait pas
- Si oui, ce site permet au client de:		
- Recueillir une information générale sur votre entreprise.	Oui	Non
- Connaître votre offre de produits et services.	Oui	Non ☐ ne sait pas
- Passer une commande en ligne.	Oui	Non ☐ ne sait pas
- Créer un profil personnalisé.	Oui	Non ☐ ne sait pas
- Suivre sa commande enligne.	Oui	Non ☐ ne sait pas

2. Votre entreprise est-elle équipée d'un ou plusieurs Intranets? ☐ oui ☐ non ☐ ne sait pas

Si oui, l'intranet de votre entreprise possède-t-il les **fonctionnalités** suivantes :

a- Accès à des sites Internet	☐ oui	☐ non	☐ ne sait pas
b- Moteurs de recherche d'informations sur l'intranet	☐ oui	☐ non	☐ ne sait pas
(q2c) c- Agenda partagé	☐ oui	☐ non	☐ ne sait pas
(q2d) d- Travail en groupe à distance (partage de fichiers, forum, chats,…)	☐ oui	☐ non	☐ ne sait pas
e- Ajouts de documents à des bases de connaissance	☐ oui	☐ non	☐ ne sait pas

Si oui, l'intranet de votre entreprise possède–t–il les **contenus** suivants:

f- Informations générales sur l'entreprise	☐ oui	☐ non	☐ ne sait pas
g- Informations spécifiques à mon métier	☐ oui	☐ non	☐ ne sait pas
h- Modules de formation en ligne	☐ oui	☐ non	☐ ne sait pas
i- Base de connaissance (technique ou métier)	☐ oui	☐ non	☐ ne sait pas

3. Votre entreprise a-t-elle diffusé une charte d'utilisation des NTIC? ☐ oui ☐ non ☐ ne sait pas

4. Le contenu des courriers électroniques fait-il l'objet d'un contrôle systématique? ☐ oui ☐ non ☐ ne sait pas

5. Vous utilisez les données du poste de travail pour contrôler l'activité effective de vos collaborateurs (par exemple sur une chaîne de production) ☐ oui ☐ non ☐ ne sait pas

6. Vous informez vos collaborateurs de cet usage des données et des temps de connexion? ☐ oui ☐ non ☐ ne sait pas

Pour les questions suivantes, merci de mettre une note de 1 à 5, sachant que 1 signifie « pas d'accord » et 5 « tout à fait d'accord ».

7. Pour votre activité principale, l'intensité de la concurrence est faible ☐

8. Le développement stratégique de votre entreprise s'appuie sur ☐
   a) des partenariats
   b) l'externalisation d'activités ☐

(q9) 9. Votre direction générale considère les nouvelles technologies de l'information et de la communication comme un enjeu stratégique. ☐

10. L'introduction des technologies de l'information a engendré
   (q10a) a) des changements de stratégie. ☐

   (q10b) b) des modifications profondes dans l'organisation de l'entreprise. ☐

(q11) 11. Les outils informatiques disponibles dans l'entreprise sont cohérents avec la stratégie déclarée de votre entreprise. ☐

12. Les technologies de l'information et de la communication constituent un avantage concurrentiel. ☐

13. Grâce aux TIC,
   a) vous êtes passés d'une relation de confrontation avec vos fournisseurs à une logique collaborative ☐

   (q13b) b) la productivité individuelle s'est améliorée dans votre entreprise. ☐

   (q13c) c) la maîtrise des coûts s'est améliorée. ☐

   (q13d) d) la capacité d'innovation de l'entreprise s'est accrue. ☐

   (q13e) e) la capacité de réaction de votre entreprise s'est accrue. ☐

   (q13f) f) les attentes des clients sont mieux prises en compte ☐

14. Les outils de pilotage ont permis d'améliorer les capacités d'anticipation des décideurs. ☐

(q15) 15. D'une manière générale, les TIC ont permis une meilleure coordination entre les différents services. ☐

(q16) 16. Grâce aux TIC, le partage de l'information s'est amélioré. ☐

17. Pour votre veille concurrentielle, vous utilisez les informations disponibles
   a. sur les sites internet de vos concurrents ☐
   b. dans des bases de données externes (brevets, données financières, greffes de tribunal) ☐
   c. dans des forums de discussion en ligne ☐
   d. au travers de listes de distribution spécialisées ☐
   e. sur des sites internet spécialisés ☐

18. Pour constituer des tableaux de bord de pilotage, le système d'information consolide automatiquement
   a. Les données de ventes ☐
   b. Les données de production, achat, qualité, marketing ☐

19. Les tableaux de bord sont mis à jour en temps réel (24h) ☐

(q20) 20. Les décisions et les orientations stratégiques des directions sont systématiquement communiquées sous format électronique (mail, intranet) ☐

21. Dans une décision impliquant deux services de votre entreprise,
(q21a) a)les collaborateurs doivent systématiquement « passer » par leur supérieur hiérarchique
(q21b) b) les collaborateurs ont toute liberté pour contacter la personne la plus compétente dans l'entreprise.

(q22) 22. Les collaborateurs mobilisent au quotidien des procédures décrivant les tâches à effectuer.

(q23) 23. Ces procédures sont consultables dans le système d'information

24. Les étapes à respecter d'un processus (administratifs, production, commande, etc..) font l'objet d'une validation en ligne (workflow)

25. Les réunions sont prioritairement fixées par:
- a- L'agenda partagé
- b- Le courrier électronique
- c- Le téléphone
- d- Le contact direct avec vos collaborateurs
- e-Le courrier interne.

26. Il est fréquent d'organiser des réunions:
- a- en face à face
- b- en conférence téléphonique
- c- en visioconférence

27. Les réunions sont:
- a- Moins fréquentes
- b- Mieux préparées.
- c- Plus efficaces.
- d- Plus courtes.
- e- Se prolongent dans des forums en ligne.

28. Grâce à l'agenda partagé, il est possible d'imposer une réunion à un collaborateur

29. Dans les groupes projet, la communication directe entre les membres est facilitée grâce aux technologies de l'information.

30. Les résultats issus des travaux de groupe sont accessibles directement en ligne dans le système d'information

31. La gestion des compétences s'appuie sur un outil informatique spécifique

32. L'information nécessaire au suivi des objectifs individuels est obtenue grâce au système d'information

33. Les meilleures pratiques de votre entreprise sont directement accessibles en ligne

34. Lorsque les collaborateurs trouvent une solution à un problème, ils alimentent systématiquement une base de connaissances

35. Le système d'information permet à chacun d'identifier et de contacter la personne la plus experte sur une problématique donnée

36. Lorsque le client entre en contact avec l'entreprise,
- a- il est automatiquement identifié grâce au SI
- b- cette information est utilisée pour personnaliser la relation.

37. Avec la base de connaissance client, les clients sont classés en fonction de l'importance accordée par votre entreprise.

38. Les données de la base client sont utilisées pour vendre d'autres produits ou services que ceux proposés dans le cadre de votre activité principale.

39. Il existe une politique de gestion des données privées des clients (transparence, cnil)

(q40) 40. La facturation des clients s'effectue automatiquement par l'échange informatisé de données (EDI, extranet)

(q41) 41. Le règlement des factures fournisseurs s'effectue automatiquement par l'échange de données informatiques (EDI, extranet).

42. Les stocks (clients-fournisseurs) sont automatiquement réapprovisionnés grâce à l' EDI. ☐

(q43) 43. Une partie des achats de l'entreprise s'effectue en ligne (e-procurement). ☐

44. Les informations relatives à une commande client ne sont saisies qu'une fois. ☐

45. Les commandes en ligne des clients alimentent directement le système d'information. ☐

46. L'offre de votre entreprise est référencée sur des places de marché électronique. ☐

47. Vous êtes engagés avec vos partenaires dans des coopérations qui s'appuient sur des outils de partage d'information ☐

Les questions suivantes nous serviront à identifier votre entreprise.

48. Quel est le secteur d'activités ***principal*** de votre entreprise? (une seule réponse possible)

- ☐ Bâtiment Travaux Publics
- ☐ Industrie
- ☐ Commerce, distribution
- ☐ Hôtellerie, restauration
- ☐ Transports
- ☐ Télécommunications et services informatiques
- ☐ Activités financières et immobilières
- ☐ Services aux entreprises (hors informatique)
- ☐ Services aux particuliers
- ☐ Autre. Précisez

49. Quelle est l'activité principale de votre entreprise?

50. Votre entreprise commercialise:

☐ des produits ou des matériels sans service associé (ex. : yaourt, boulons)	☐ des produits avec des services associés (ex. : voiture+assurance+financements)	☐ des services mobilisant du matériel important (ex. : transport aérien, hôtellerie)	☐ des services purs (ex. : conseil en stratégie)

51. Quel est l'effectif total en nombre de personnes de votre entreprise ? (siège + établissements)

☐ < 50 ☐ 51-500 ☐ 501-5000 ☐ 5001-10 000 ☐ > 10 000

52. Quel est le chiffre d'affaires de votre entreprise (en millions d'euros)?

☐ < 7,6 M€ *50 MF* ☐ de 7,6 à 76 M€ *(50 à 500 MF)* ☐ de 76 à 150 M€ *(500 MF à 1 Milliard)* ☐ de 150 M€ à 1500 M€ *(1 Milliard à 10 milliards de F)* ☐ > 1 500 M€ *(> 10 milliards de F)*

53. Quelle est la part de votre chiffre d'affaires réalisée à l'étranger ?

☐ < 10 % ☐ de 11 à 25% ☐ de 26 à 50% ☐ de 51% à 75% ☐ > 75%

54. Votre entreprise est implantée sur (plusieurs réponses possibles):

- ☐ Un seul site en France
- ☐ plusieurs sites en Europe
- ☐ sur plusieurs continents.

55. Dans votre entreprise, vous êtes amenés à revoir vos prévisions de chiffre d'affaires tous les :

☐ mois ☐ 3 mois ☐ 6 mois ☐ 9 mois ☐ ans

56. Dans votre entreprise, combien y-a-t-il de niveaux hiérarchiques (du collaborateur de premier niveau au PDG inclus) ?

☐ 2 ☐ 3. ☐ 4 ☐ 5 ☐ 6 ☐ plus de 6

57. L'organigramme de votre entreprise est plutôt orienté

☐ fonction ☐ marché ☐ pays ☐ projet

58. Existe-t-il dans votre entreprise un département ou une filiale e-business ? Oui Non

59. Qui est responsable de la stratégie Internet ?

Directeur général
Directeur marketing
Directeur des systèmes d'informations
Directeur financier
Directeur de la communication
Direct eur e-business
Webmestre.

60. Votre entreprise est-elle un groupe ?

☐ oui ☐ non

61. Si oui, la maison-mère est d'origine :

☐ française ☐ européenne ☐ américaine ☐ asiatique ☐ africaine

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