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Research article

Enhancing the measurement of information technology (IT) business alignment and its influence on company performance

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Abstract

Studies for over 30 years have consistently indicated that enterprise-level Business-Information Technology (IT) alignment is a pervasive problem. While significant progress has been made to understand alignment, research on IT alignment is still plagued by several problems. First, most alignment models approach alignment as a static relationship in contrast to analyzing the scope and variance of activities through which the alignment is (or can be) attained. Second, most alignment models are not founded on strong theoretical foundations. Third, because of their static view, these models do not guide how organizations can improve alignment. This study addresses these weaknesses using a capability-based lens. It formulates and operationalizes a formative construct rooted in the theory of dynamic capabilities and defines the scope and nature of activities that contribute to alignment. The construct identifies six dimensions promoting alignment: (1) IT-Business Communications; (2) Use of Value Analytics; (3) Approaches to Collaborative Governance; (4) Nature of the affiliation/partnership; (5) Scope of IT initiatives; and (6) Development of IT Skills. The construct measures are validated in terms of their dimensionality, item pool sampling, and the nomological and predictive validity. The research uses Partial Least Squares (PLS) to statistically validate the construct using a dataset covering over 3000 global participants including nearly 400 Fortune 1000 companies. All construct dimensions contribute significantly to the level of alignment and the construct shows strong nomological and predictive validity by demonstrating a statistically significant impact on firm performance. Scholars can leverage this research to explore additional activity-based constructs of IT-business alignment.
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Introduction

Practitioners and academics have debated for over three decades how to align Information Technology (IT) services and/with business goals, while proposing a myriad of models and methodologies for this task (e.g., Henderson and Venkatraman, 1993; Luftman *et al.*, 1993; Reich and Benbasat, 1996, 2000; Teo and King, 1996, 1997; Maes *et al.*, 2000; Bergeron *et al.*, 2001; Marchand *et al.*, 2001; Hu and Huang, 2005). Yet, despite extensive research, the concept of alignment and its detection remain elusive. Past studies often have ineffective theoretical grounding, use weak operationalization of IT-business alignment (e.g., Sabherwal and Kirs, 1994; Maes *et al.*, 2000) and therefore suffer significant measurement challenges. Because alignment is frequently defined as a static relationship, the studies often offer little practical guidance on how managers can improve IT-business alignment.

A related problem is what type of alignment and at what level alignment contributes to improved business performance. While significant evidence has been garnered regarding the positive impact of IT-business alignment on business performance and its specific antecedents (for a recent review see Coltman *et al.*, 2015) research into the nature of alignment construct and its operationalization has so far progressed with a relatively weak conceptualization and mixed focus. As Coltman *et al.* (2015: 92) note: 'The growing family of alignment constructs, lack of coherence in the way that alignment is conceptualized and measured, combined with

mixed results.' Moreover, most studies are fraught with relatively small samples and sampling bias because of a single industry focus (e.g., Weill, 1992; Byrd *et al.*, 2006, examined a group of manufacturing firms; Chan *et al.*, 1997; Ittner *et al.*, 2003, focused on financial services firms; Harris and Katz, 1991, investigated insurance companies), company type focus (e.g., Hussin *et al.*, 2002, studied IT alignment in small firms); or geographic focus (e.g., Henderson and Venkatraman, 1993, considered companies in North America; Cumps *et al.*, 2006, investigated European companies). As a result it is difficult to generalize the effects of IT-business alignment across different industries, competitive contexts, and/or firm characteristics.

To alleviate some of these problems, this study proposes a more encompassing construct of IT-business alignment founded on the theory of dynamic capabilities. The construct uses the concept of direct effects of alignment activities and their scope (Coltman *et al.*, 2015) and extent as a measure to detect the level of alignment (Teece and Pisano, 1994; Eisenhardt and Martin, 2000). In this regard it focuses on critical behavioral antecedents that are likely to influence IT-business alignment as a dynamic relationship between the business and IT. Alignment activities, in turn, are defined as IT-business and business-IT related managerial behaviors that can enable and promote the coordination and 'harmonization' of activities across the business and the IT domain in ways that add business value. In this regard, the construct provides a more comprehensive, dynamic characterization of the IT-business alignment and offers operational ways to improve IT-business alignment than current mostly perceptual measures that capture the business or IT manager's perception of the level of IT-business alignment (for a review see Coltman *et al.*, 2015). We also demonstrate that the construct has a strong predictive validity in that the level of reviewed activities are shown to influence the firm's value adding capability. Therefore their effective enactment is likely to influence the firm's overall performance.

To empirically validate the proposed construct the research uses an encompassing data set collected from IT and non-IT executives covering 395 Global 'Fortune 1000' companies operating within 16 industries, 5 global regions and 18 countries. The data captures reports of alignment behaviors across 3029 managers over a 13-year period (2000–2013) operating under different organizational structures. The remainder of the paper is organized as follows. The next section reviews the dominant concept of business and IT strategy alignment. The subsequent articulates the construct of IT-business alignment and formulates the related hypotheses. The penultimate section outlines the study's methodology and reports the main findings concerning construct validation and its nomological/predictive validity. The final section summarizes the results, notes limitations, and suggests directions for future research.

Theoretical review

The concept of IT-business alignment

The idea of IT-business alignment has been expressed using multiple terms including 'fit' (Venkatraman, 1989), 'harmony' (Luftman *et al.*, 1993), 'fusion' (Smaczny, 2001), 'integration' (Weill and Broadbent, 1998), and 'linkage' (Henderson and Venkatraman, 1993) (for a recent review see also Coltman *et al.*, 2015). This study considers all these terms synonymous, if they capture the idea of coordinating activities across IT and non-IT domains within the firm in ways that are likely to provide new services, improve business processes and decision making and thereby increase the business value of the firm. Furthermore, alignment is not a state of being aligned or not aligned, rather it is how this relationship needs to be adjusted based on business contingencies.

Because of the inherent value creation objective, IT-Business alignment literature has been entrenched with a deep normative dimension: the quest that IT and the business *should* be aligned and how this *should* be accomplished. The phenomenon, however, also has a descriptive dimension which deals with questions such as what is IT-business alignment, what is the degree of IT-business alignment, how such alignment can be detected, and thereafter what antecedents might explain this outcome and what the consequences of the level of alignment might be. This study addresses these descriptive questions: what is IT-business alignment, how the alignment *can be detected*, and what are *its consequences*?

Because of the strong normative expectations underlying alignment research, the presence of weak (or its absence) alignment has been treated as an axiom and claimed to be a persistent problem (Luftman and McLean, 2004; Luftman, 2005; Luftman *et al.*, 2006; Chan and Reich, 2007a; Luftman and Kempaiah, 2008; Luftman and Zadeh, 2011). Indeed, for over three decades surveys on IT management have consistently ranked the *lack* of alignment as one of the top organizational challenges (e.g., Kearns and Sabherwal, 2007; Preston and Karahanna, 2009). During the same period the level of alignment has demonstrated some improvements (Luftman and Ben-Zvi, 2010; Luftman *et al.*, 2013). Yet, the challenge remains; because of the normative focus many studies of IT-business alignment have been conceptual and lacked good measurements.

The state of the art of measuring IT-business alignment

Several weaknesses can be detected in the past empirical research on alignment (for recent reviews see Gerow *et al.*, 2014; Coltman *et al.*, 2015): (1) there is a tendency to look at alignment as a singular state or relationship rather than a dynamic composite of multiple distinct dimensions; and (2) there is no unified agreement on what alignment truly means and how it can be detected; (3) current constructs are not appropriate for IT and business executives to evaluate the prevailing level of alignment and how to improve it (Luftman and Kempaiah, 2008; Luftman *et al.*, 2010; Luftman and Ben-Zvi, 2011, 2010). The literature examines alignment from multiple perspectives; principally strategic, structural, social, and cultural. The presented research focuses on the dominant strategic perspective (see Gerow *et al.*, 2014; Coltman *et al.*, 2015 for key definitions) that examines the degree to which the business and IT strategy and plans (external integration) complement each other through intellectual alignment, and to what extent related IT and business infrastructures are aligned (internally and cross-domain integration) through operational alignment. In addition, researchers have found that alignment is contingent upon the type of strategy, industry, governance structure, or the social and cultural aspects of the organization (Reich and Benbasat, 1996; Gerow *et al.*, 2014). Consequently, the IS literature covers an array of different

approaches to assess alignment, including case studies, fit models, surveys, conceptual models, and quantitative assessments. Chan and Reich's reviews (2007a, b), Gerow *et al.*'s (2014) recent meta-analysis, and Coltman *et al.*'s (2015) review provide a good summary of much of the history and research in the area.

Most alignment models and ideas of external and internal integration are anchored in Henderson's and Venkatraman's (1993) seminal conceptual model that defines four necessary *static elements* that need to be aligned for business IT alignment: (1) business strategy, (2) IT strategy, (3) organizational infrastructure, and (4) IT infrastructure. These alignment relationships are described in terms of the quality of the interactions between the four elements. Accordingly, the authors suggest a distinct alignment process (intellectual, operational) for each of the four relationships. They also note that in each dimension IT and business managers enact different roles and share different responsibilities as they create the alignment.

The original Henderson and Venkatraman model was purely conceptual and offered no means to analyze and detect alignment and their levels. Therefore the model was later expanded with several measures to detect the level of alignment (for an extensive review see Gerow *et al.*, 2014). Luftman (1996), for example, augmented the model with eight mechanisms that would contribute to alignment in each dimension; Maes *et al.* (2000) proposed a framework for measuring alignment levels for each of the four dimensions and incorporated functional, and strategic layers into the model to reflect the need for sharing alignment related information. These models, however, do not offer detailed ways of establishing content, face, discriminant, and convergent validity. Recently, Gerow *et al.* (2014) conducted a meta-analysis of 71 papers covering 78 data sets to assess the cumulative findings concerning the impact of each alignment dimension on the performance. They observed two principal ways in which alignment had been measured (Chan and Reich, 2007a, b): 'Fit models' and 'Single measures'. Fit models rate business strategies and IT strategies separately (often through a questionnaire) and then determine the fit between the two along the dimensions suggested by Venkataraman, as, for example, a profile or co-variation, and based on that determine the level of alignment. Single measures are based on Likert type scales which directly capture the respondent's perception of the alignment in their organization typically along the three dimensions (intellectual, operational, cross-functional) of Henderson and Venkatraman (1993) model. The most common type of measurement has been the single-respondent-single measurement study that has looked at static alignment between IT and business strategy. Key streams of research and their key insights and findings, and key strengths and weaknesses are summarized in Table 1. The table is not comprehensive, but offers a good representative sample of key studies and their profiles, and thus captures the state of the art. The studies are listed separately as conceptual studies (focus on the concept and construct of alignment), empirical studies (studies that sought to detect the level of alignment and either its antecedents (as a dependent variable) or its consequences (as an independent variable)).

Overall, the summary hints at several gaps in the previous alignment research:

1. Proposed alignment models are mostly static.
2. Models are not grounded in strong theory and often include a narrow and *ad-hoc* set of scales for detecting alignment usually between 3 and 6 factors (see Table 1 for example).
3. Studies are limited in sample sizes and cover one industry at time, which casts doubts of the generalizability of the findings.
4. Research focuses on how well companies have achieved the alignment, or on how to measure static alignment (Hussin *et al.*, 2002), but lack actionable conclusions that would provide managers ways to improve alignment.

To address these gaps this paper will next suggest a new construct of IT-Business alignment. It will also review how it correlates to financial performance, to demonstrate its nomological and predictive validity. The model is extensive and composed of six distinct activity dimensions (and each with several sub-dimensions). The overall model and each of the respective dimensions is grounded in theory of capabilities, thus addressing Gaps 1–2. The paper also validates the model using comprehensive empirical evidence from 16 different industries, 5 global regions, and 18 different countries, covering a 13-year period, thus enhancing its external and ecological validity (Gap 3). Owing to its activity focused nature it also provides some diagnostics for managers to improve the level of alignment (Gap 4).

IT-business alignment model

The starting point for the new construct is Luftman's *et al.* (1999) study on enablers and inhibitors of business-IT alignment. The field research identified (based on interviews with CIO's, IT managers, and functional managers) several areas that promote or inhibit business-IT alignment. It thereby enlisted salient activities that management need to carry out or mitigate to achieve goals concerning coordinated IT deployment across the organization. This list of enablers and inhibitors was later formulated into a generic model that identifies a set of capabilities that enable, enhance, or mitigate IT-business alignment (Luftman, 2000). While developing the model the lead author carefully reviewed the extant literature on IT and business related activities for theoretical triangulation. This resulted in an extensive typology of activities to be carried out either by the IT function, business functions, or both in relation to developing, using or monitoring IT and thereby achieving alignment. Only those activities, which in the past had been shown to have a strategic effect (see, for example, Luftman *et al.*, 2008) were included in the final typology, offering a tentative classification of IT *and* business related activities promoting IT-business alignment.

Overall, the proposed model does not view IT-business alignment as a singular (though varying) state along the four dimensions, but rather a continuous process of adjusting activities across multiple dimensions that together results in improved/better alignment. Accordingly, in contrast to taking an evaluative or summative approach to alignment the model approaches alignment as a formative, holistic construct: what types of activities *jointly* result in a better alignment. Accordingly, the model is called the Strategic Alignment Maturity (SAM)[1] model because it captures *the scope and the level of activities through which the IT function and business functions*

Table 1 A review of alignment research and measures

Authors	*Construct nature*	*Operationalization*	*Model strengths*	*Model weaknesses*
conceptual studies				
Henderson and Venkatraman (1993)	A concept based on strategic fit and functional integration	Four domains of strategic alignments: • Business strategy • IT strategy • Organizational infrastructure and processes • IT infrastructure and processes	Focuses on the nature of IT capabilities and organization designs that enable to exploit the business potential of IT through aligning four dimensions	• Conceptual • Lacks diagnostics • Neglects how companies are able to achieve alignment
Broadbent and Kitzis (2005)	How to weave together business and IT strategies and what related factors influence the success of IT-enabled business projects	Four factors influence alignment • A CIO • An executive team with an informed expectations for an IT-enabled enterprise • Clear IT governance • Adopting portfolio management approach	A conceptual model discussing elements that provide necessary building blocks for business-IT linkages	• Conceptual○ Generic ○ Lacks empirical validation
Maes *et al.* (2000)	Aligning business and IT is a matter of management and of design. The model is derived from a generic framework for information management and an integrated architecture framework	• Management (strategy, structure, operations) • Areas of concern (business, information and communication, technology systems infrastructure) • Design	A unified framework of alignment	• Conceptual high-level model ○ Does not examine how companies achieve alignment
Empirical studies				
Brown and Magill (1994)	Explores the concept of IS and organizational design patterns of internal and external antecedents	Examining a firm's IS organization design decision for a decentralized, centralized, or hybrid structure	A conceptual framework for IS and organization design and its assessment	• Narrow scope focusing on organizational design • Little empirical evidence ($N = 6$)
Sabherwal and Kirs (1994)	Alignment between critical success factors and IT capability	• Environmental uncertainty • Organizational integration • IT management sophistication	Alignment defined between business factors and IT capability and their impact on overall performance	• Empirical study focused on academic institutions • Limited number of alignment variables • Empirically derived ideal profile of IT capability • Adopted a static view of alignment
Hussin *et al.*, 2002	The alignment between the contents of business and IT strategies	Three factors influencing alignment: • CEO commitment to IT • IT sophistication • External IT expertise	Exclusively measures the fit between IT strategy and the business strategy	• Limited number of alignment factors • Excludes processes associated with IT alignment, such as functional integration, organizational factors, and so on

Bergeron *et al.* (2001)	Alignment of strategic IT management, environment uncertainty, strategic orientation, and structural complexity	Six 'fit' perspectives: • Moderation • Mediation • Matching • Covariation • Profile deviation • Gestalts	Describes how different conceptualizations and analysis methods of fit lead to different results	• Small sample size ($N = 110$) • No theory foundation
Reich and Benbasat (1996)	Analyze the social dimension of business-IT alignment	• Cross references between written business and IT plans • IS and business executives' mutual understanding of each other's current objectives • Congruence between IS and business executives' long-term visions for IT deployment • Executives' self-reported rating of linkage	Provides a scheme that shows different ways of conceptualizing and identifying short- and long-term aspects of the social dimension of alignment	• Limited only to the social dimension of alignment • Very small data sample: 10 business units in only one industry – life insurance
Gerow *et al.*, 2014	Meta-analysis of effects of alignment on firm performance	• Three domains (internal, cross-domain, external) of integration • Intellectual and operational alignment • Thee domains of effect: financial performance, productivity, customer benefit • Contextual variables of ○ Turbulence ○ strategy type ○ governance ○ social alignment ○ IT investment level	Extensive and systematic analysis of 71 studies of impact of alignment on performance • Alignment dimensions are highly correlated • Alignments dimensions have positive effect on performance – most consistent for productivity and financial performance • Contextual variables influence the level of alignment	• Static view of alignment dimensions • Rough and often poorly developed scales for alignment dimensions • Only few studies looked at operational or cross-domain integration that is often critical for value creation
Practice oriented studies				
Luftman (1996)	Alignment is concerned with relationships among the 12 components that define business-IT alignment	Twelve alignment components: Business Scope, Distinctive Competencies, Business Governance, Organization Infrastructure and Processes, Administrative Structure, Organization Infrastructure and Processes: Skills, Technology Scope, Systemic Competencies, IT Governance, IT Infrastructure and Processes, IT Infrastructure and Processes Architecture, IT Infrastructure and Processes Skills	Provides practical method of improving alignment (rules of thumb)	• Lacks a theoretical basis (the process leading to alignment and how to measure alignment) • Ignores relationships between 12 components

Table 1 Continued

Authors	*Construct nature*	*Operationalization*	*Model strengths*	*Model weaknesses*
Luftman *et al.* (1999)	Identifies functional areas that promote or hinder alignment of IT plans with business plans	Enablers: Senior executive support for IT, IT involved in strategy development, IT understands the business, Business-IT partnership, Well-prioritized IT projects, IT demonstrates leadership Inhibitors: IT/business lack close relationships, IT does not prioritize well, IT fails to meet its commitments, IT does not understand business, Senior executives do not support IT, IT management lacks leadership	The areas identified as enablers and inhibitors are viewed to be common across industries, business functions, and across time	• Lacks stronger a theoretical basis

engage to enable or drive the firm's value adding activities when IT is recognized as a necessary component.

In the SAM model the alignment construct is formulated as a six dimensional (formative) construct along which IT-business alignment activities are organized. These dimensions are: (1) Communications; (2) Value Analytics; (3) IT Governance; (4) Partnering; (5) IT Scope; and (6) IT Skills development. Each of these dimensions is postulated to improve IT-business alignment as described in the next section with a hypothesis. Each of the dimensions have been also evaluated for its strategic impact based on field assessments.[2] Each of the six dimensions is further comprised of several sub-dimensions, a set of varied activities.

IT-business alignment hypotheses

The six dimensions of the SAM model are the following:

Communications refers to the intensity and quality of the exchange of ideas, knowledge, and information between IT and business organizations. These communications enable stakeholders to clearly understand their respective strategies, plans, business or IT environments, risks, priorities, and how to achieve them. Too often there is little business awareness on the part of IT or too little IT appreciation on the part of the business. Given the dynamic business and technical environments that continuously confront organizations, knowledge sharing is paramount. Several studies show that effective communications between IT and the business lead to increased mutual understanding (Reich and Benbasat, 2000) and influence positively alignment as understanding is instrumental in achieving coordinated activities. While engaging in communications IT and business executives also learn to listen, understand, and respect one another. This facilitates the collaborative leveraging of resources that can build competitive advantage (Luftman *et al.*, 1999). Communications help also integrate and effectively coordinate plans between IT and the business (Rockart *et al.*, 1996) while the lack of communications often translates into lack of investment in IT and related missed opportunities (Luftman, 2000). Finally, communications result in trusting relationships between IT and business executives. This understanding is important as organizations grow, and the need for integration across the enterprise and its external partner's increases. This permits higher risk taking, faster responses, and better accountability. Thus we posit:

H1a: Communications have positive impact on IT-Business Alignment

Value Analytics refers to the potential use of metrics to demonstrate the contributions of IT and the IT organization to the business in terms that both the business and IT understand and accept. All organizations need to analyze their performance and operations. Many IT organizations cannot currently demonstrate their value to the business in terms that the business understands. What is needed is a balanced 'dashboard' that clearly demonstrates the value of IT in terms of contribution to the business. To do so effectively, IT and business organizations need to collaborate and create analytics (shared and consistent measures of performance) that help track firm's or the function's performance. This requires garnering and applying relevant technical expertise from the IT function that can provide demonstrable measures in forms

that the business can comprehend (Luftman, 2000). Similarly the business needs to learn to apply and expect competencies from the measurement within IT. Such a balanced process demonstrates the value of IT in terms of its contribution to tracking and learning from business initiatives, and facilitates the management ability to demonstrate IT's value contributions (Luftman, 2000; Ittner *et al.*, 2003). Thus we posit:

H1b: Value Analytics have a positive impact on IT-Business Alignment.

IT Governance refers to the allocation of authority for IT decisions and the processes IT and business manager's use at strategic, tactical, and operational levels for setting IT priorities, allocating resources, and controlling activities. Governance also deals with how well the company connects its business strategy to current IT priorities, technical planning, managing risk, and budgeting. It determines who makes the decisions (power), why they make them (value), and how they make them (decision process; e.g., portfolio management). Governance related activities contribute to alignment because they help: (1) recognize the value of IT; (2) define a business vision and strategies and the role of IT in achieving them; and (3) make informed IT investment decisions. The key activities for governance include: steering committees, IT-business liaisons, budget and human resource/sourcing allocation processes, boundary management of the IT function, and assessments of IT services by business executives. Governance should be focused on providing those activities that create a shared direction rather than merely trying to monitor IT initiatives. Studies show that expanded modes of IT governance improve IT-business alignment (Raghunathan, 1992; Brown and Magill, 1994; Teo and King, 1996; Smaczny, 2001). Thus we posit:

H1c: IT Governance (activities) has a positive impact on IT-Business Alignment

Partnering refers to the level of relationship between business and IT organizations. This includes defining IT's role in business strategies, the degree of trust between the two organizations, and how each perceives the other's contribution. It is fundamental for the IT function to directly collaborate with the business functions that can create mutual trust, create realistic expectations, and build effective relationships. It is thus easier to achieve alignment with cross-functional teams that sustain working relationships that help understand and commit to shared strategies as they lead to risk and reward sharing (Luftman *et al.*, 1999). Both IT and business executives must observe the need for cooperation and the increased value of more intimate relationships (Keen, 1996; Luftman *et al.*, 1999; Reich and Benbasat, 2000). Thus we posit:

H1d: Partnering has a positive impact on IT-Business Alignment

Dynamic IT Scope refers to the continuous process of provisioning a flexible infrastructure, its evaluation, and the application of emerging technologies and delivery of customized solutions to business units and external customers or partners. This dimension taps into the broader impact of IT services through appropriate and innovative scoping of what the IT function does to provide demonstrable business value. Scoping is the only set of technical activities included in the alignment processes. Dynamic scoping is needed because as companies change their business scope their infrastructure needs to be re-scoped (Foster, 1986; Keen, 1991). Therefore IT Scoping is about the generation of shared activities that create a flexible IT infrastructure, evaluate and apply emerging technologies, and foster IT related activities that drive direct business process change or deliver customized solutions/services. The scoping activities include among others shared application development considerations, standards articulation, architectural integration and architectural transparency, agility principles, and activities that promote infrastructure flexibility (Luftman, 2000). Thus we propose:

H1e: Dynamic IT Scoping has a positive impact on IT-Business Alignment

Business and IT Skills Development refers to the human resources practices, such as hiring, retaining, training, performance feedback, innovation encouragement, career opportunities, and individual skill development within IT. It also measures the organization's readiness for change, learning capability, and ability to leverage new ideas. Without the appropriate investing and balancing of skills and competencies (sourced internally or externally) across the business and IT organization, it is difficult to achieve the desired levels of communications, value analytics, and partnering. Previous research has shown the positive impact of higher quality and appropriately balanced human resources in promoting alignment (e.g., Bohlander and Snell, 2007; Pynes, 2008). Thus we posit:

H1f: IT Skills development has a positive impact on IT-Business Alignment.

IT-business alignment and company performance

In general, IT investments form one critical factor that affects business performance (Brynjolfsson and Hitt, 2000; McAfee and Brynjolfsson, 2008; Luftman and Ben-Zvi, 2011). Therefore, alignment between business and IT can be instrumental in improving organizational performance. This is because of the following (Reich and Benbasat, 1996, 2000; Chan *et al.*, 1997; Sabherwal and Chan, 2001; Kearns and Sabherwal, 2007; Gerow *et al.*, 2014):

(1) The heightened strategic role of IT: Lack of alignment leads to wasting investments to non-strategic causes.
(2) Resource scarcity: not all important IT investments can be carried out and IT alignment helps more optimally set priorities.
(3) Creating synergy/complementarities: there is a need for integrating systems and the lack of alignment leads to difficulties in acquiring synergistic benefits from these activities.

Past studies investigating the relationships between IT investments and company performance show systematically that IT investments improve performance, if and when investments are made simultaneously to complementary assets (McAfee and Brynjolfsson, 2008). One such asset (capability) is a holistic set of activities that align IT and business operations and give synergistic direction to both. Not surprisingly, Sriram and Stump (2004) found insignificant direct effect of IT investments on performance but a significant indirect effect when IT-management relationship quality was added as a mediator.

A 2014 Gerow *et al.* meta-analysis also shows that 'alignment-performance relationship is positive across studies, which suggests that there is *not much of an alignment paradox* (Gerow *et al.*, 2014: 1172, emphasis original).

In other words, the firm level effects of IT investments are mediated by the relationship quality between business and IT. Previously used measurements, however, have not formatively defined what constitutes the dimensions that constitute the alignment in IT and business activities. This study posits that this relationship quality is a *holistic* concept of mutually dependent activities encompassing all six dimensions of activities, that is, that are all necessary for reaching a high-level of alignment. IT-business alignment as constituted through these six dimensions can thus be viewed as a critical organizational-level capability that positively impacts the overall organizational performance because of its positive influence on IT investment effectiveness and efficiency. Therefore, we posit:

> **H2:** IT-business alignment, when expressed as a joint formative construct of all six dimensions of alignment (activities) has a positive impact on company performance whereas none of them separately has such effect.

A summary of the overall research model related to IT-business alignment is illustrated in Figure 1.

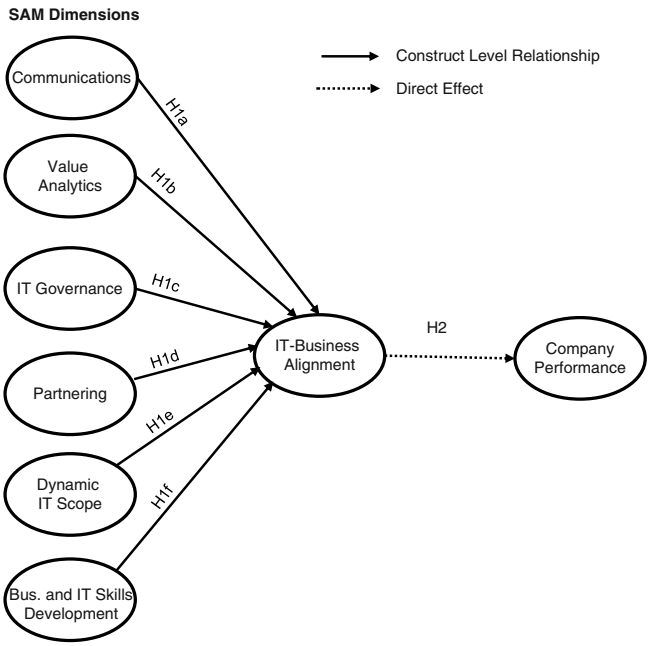

Figure 1 The research model.

Empirical validation

This research conducted a psychometric survey to carry out scale validation and to validate the research model expressed in Figure 1. The data collection and steps carried out in creating the scales is discussed next, and is followed by a section describing the findings.

Model development

To conceptually develop the model for completeness, clarity, and relevance as required by a formative construct, several interviews were carried out with IT practitioners and experts including scholars, CIOs, management consultants, and business executives. The goal of these interviews was to identify the key aspects and the attributes in each construct's domain included in the emerging typology. Thereby the typology was evaluated for completeness, for example, whether all relevant activities are included, and whether each activity articulates a distinct and conceptually salient activity (disjointness). This resulted in the initial complete typology which was next validated for content validity and comprehensiveness using another round of interviews with CIOs, management consultants, and academics.

Next, an instrument gauging the presence and level of activity within each of the identified classes of activities was developed. The instrument was again validated using structured interviews with executives (IT and non-IT) to ensure that the items had face and content validity, and were understandable. During this process several questions were removed and modified to clarify ambiguous questions. The content and practical validity was next validated by applying the instrument to 10 firms where both IT and business executives could elicit their opinions on the merits of the assessment of their level of activities (Sledgianowski, 2003; Nash, 2006). Again several revisions were made. The final instrument included in the study where the scale was validated is listed in Appendix A, keeping in mind that the intent is to use the questions primarily as an interview guide. The final list of activities including their definitions is included in Appendix B. Next the final 41 items (detailed description is in Appendix C) were articulate to measure the level of effort that the organization expends in that specific activity (using a 5-point Likert scale). The level of each activity is further expected to be assessed by the IT and the non-IT executives to ensure a common valuation and rating of that activity level.

Overall, the SAM model specifies a second-order formative construct of IT alignment that taps into the six distinct dimensions of activities which each expresses a varying level of different kind of alignment through its set of formative indicators. Consequently, the construct operationalization and related scale development followed established practices of defining and specifying formative constructs (Marakas *et al.*, 2007; Cenfetelli and Bassellier, 2009; Bollen, 2011).

Data collection

The data used in this study were obtained from 3029 IT and non-IT executives and consultants from 395 'Global Fortune 1000' organizations representing 16 different industries. The data collected covered a 13-year period. Of the 3029 individual executive responses, 1675 came from IT (CIOs and CTOs), and 1354 responses came from the business (CEOs, CFOs, COOs, and other non-IT business unit executives). The data collection was frequently (80%) done via interviews and group discussions to obtain a consensus, especially when there were differences of opinion. Participants were asked to rate their organization's behavior in each of the instrument's 41 items. This permitted executives to freely express their opinions on these factors based on their own experience rather than being limited to express their ideas in ways that were determined by researchers. The responses were then converted using a 5-point Likert scale to identify the strength of alignment within their companies and later subsequently with the respondent.

Table 2 The distribution of respondents by industry sector ($n = 3029$)

Industry classification	*Percentage*
Agriculture	1.3
Chemical	3.0
Education	2.4
Finance	25.6
Government	4.8
Health care	2.8
Hotel/entertainment	1.8
Insurance	10.3
Manufacturing	15.0
Oil/gas/mining	0.1
Pharmaceuticals	2.9
Retail	4.3
Services	2.0
Telecommunication	16.8
Transportation	2.0
Utility	3.4

Table 3 The distribution of respondents by region ($n = 3029$)

Region classification	*Percentage*
Asia and Australia	16.5
Europe	16.8
Latin America	8.2
Middle East/Africa	1.9
North America	56.6

In addition to rating their organization's behavior, the executives were asked, within the context of their function (business or IT), to identify the key elements for achieving alignment. This subjective assessment was used to identify additional factors or elements the executives regarded significant in influencing alignment. No additional dimensions or factors were detected, however.

The remaining 20% of the research data was obtained by having a facilitator from the organization being assessed mail/email the instrument to organizational stakeholders and asking them to complete a questionnaire (see Appendix B). This approach provided a response rate of greater than 90%. As with the interviews, data from each item was ranked on a 5-point Likert scale. The 5-point Likert scale was used in this study for several reasons: (1) this is the most universal method for data collection and it is easily understood by participants; (2) it allows participants to respond in a degree of agreement or disagreement, rather than take an actual stand on a certain issue; and (3) the results are easily quantifiable and thus, easy to analyze. Nevertheless, this scale constrained participants to the given options and thus, may not identify what could be described as the true attitude of the respondents, albeit interview discussions provide participants with opportunities to discuss these considerations. Also, participants may be influenced by their answers to previous questions, or concentrate their responses on one response column. Sometimes, responses could be compromised because of social desirability. For example, even when data are anonymized, participants tend to avoid choosing the 'extreme' options on the scale (1 or 5), because of the negative connotation of being an 'extremist,' even if that choice would be the most accurate.

Table 2 provides a breakdown of the respondents by industry and Table 3 provides a breakdown by region.

Statistical analysis

The statistical analysis and validation of the scales and validation of the research model was conducted using XLSTAT 2011 a popular second generation Structural Equation Modeling (SEM) package (see Vinzi *et al.*, 2010; Ashill, 2011) that uses Partial Least Squares (PLS) technique. It combines factor analysis with linear regression, making only minimal distribution assumptions. Since PLS also supports the mapping of observed variables to formative constructs, it was deemed best suited for evaluating the measurement model (also see Bollen, 1989, 2011; Hair *et al.*, 2010).

The data were first reviewed for inaccuracies, incompleteness, and unreasonable values to improve the quality of the dataset for statistical analysis (Chapman, 2005). Incomplete data in this study represented approximately 2.5% of the responses; these were excluded from further analysis. That is, the original number of respondents was 3107 because of incomplete data, this number was deduced to 3029 data points reported in this work. No other significant concerns were detected. Data from each dimension's items were averaged to obtain the dimension's score for each data entry.

To articulate a valid measurement model, multi-collinearity analysis between items was conducted to demonstrate the distinct role of each of the six dimensions. Two procedures to assess multicollinearity were used: (1) Correlation Analysis; and (2) Variance Inflation Factor (VIF). High correlations between variables (usually, 0.85 and higher) hint at substantial collinearity (Hair *et al.*, 2010). Correlations were computed for the six dimensions obtained from PCA (see Table 4). The variables exhibit relatively high correlations' ranging from 0.67 to 0.75, but no correlation goes over the 0.85 threshold. As each of the constructs is formative, a further analysis of the 41 items that make up the six dimensions was conducted. The 41 items present a correlation ranging from 0.01 to 0.69, again, no correlation exceeds the 0.85 threshold.

Following Hair *et al.* (2010), each independent variable was regressed against the remaining independent variables, and then used R^2 to calculate Tolerance (i.e., $1–R^2$) and the VIF (1/Tolerance). Multi-collinearity was assessed for each factor individually (see Table 5).[3] Literature suggests different thresholds for VIF: Diamantopoulos and Winklhofer (2001) present a VIF cutoff of 10 that corresponds to a multi-collinearity of 0.9; Kline (2005) suggests that multi-collinearity should be below 0.85, which gives a VIF of 6.7. No factor presented a VIF above the 6.7 threshold. We therefore conclude that although some factors exhibit relatively high correlations, the data does not present significant threats to multi-collinearity.

Table 6 summarizes the aggregated means, standard deviations, skewness, and kurtosis of the six SAM dimensions. The table shows that the means do not significantly differ: IT Scope had the highest mean score (3.12), following by IT Governance (3.11), Partnering (3.08), Communication (3.00), and Value Analytics (2.94). Business and IT Skills Development had the lowest mean (2.92). Skewness and kurtosis were not high and did not raise any concerns.

Table 4 Correlations between the six dimensions

	Communication	*Value analytics*	*IT governance*	*Partnering*	*IT scope*	*Skills development*
Communication	—					
Value analytics	0.73					
IT governance	0.74	0.75	—			
Partnering	0.74	0.74	0.78	—		
Dynamic IT scope	0.67	0.67	0.72	0.72	—	
Business and IT Skills development	0.68	0.69	0.71	0.73	0.71	—

Table 5 Construct tolerance and VIF

Dimension	*Tolerance*	*VIF*
Communication	0.34	2.93
Value analytics	0.33	3.00
IT governance	0.28	3.59
Partnering	0.28	3.61
Dynamic IT scope	0.37	2.69
Skills development	0.36	2.81

Table 6 SAM means and standard deviations

	Mean	*Standard deviation*	*Skewness*	*Kurtosis*
Communication	3.00	0.72	0.20	0.16
Value analytics	2.94	0.84	0.22	−0.09
IT governance	3.11	0.77	−0.05	0.02
Partnering	3.08	0.85	0.15	−0.23
Dynamic IT scope	3.12	0.81	0.02	−0.10
Business and IT skills development	2.92	0.82	0.38	0.12

Findings

The main challenge in evaluating the measurement model came from the causal nature of the model; as a set different measures delineate the coverage of the whole alignment construct; taken individually, it evaluates each dimension's contribution toward that coverage of the construct. Table 7 presents the results of the SEM analysis of the measurement model by showing the estimates of the individual factor measures' weights for their respective dimension, their standard error, *t*-statistic, and *P*-value related to the influence of each dimension on business alignment (see also Figure 2). Two important findings are: (1) all paths are statistically significant (*P*-value<0.001) demonstrating the causal impact of the six dimensions in constituting the alignment; (2) each factor's impact (loading) does not vary much: the lowest value is 0.0231 (Communications) and the highest value is 0.294 (Value Analytics) suggesting that the there are no major differences in each dimension's contribution to alignment. Overall, these findings *support* Hypotheses *H1a* to *H1f*.

Additional structural analysis was conducted to establish nomological and predictive validity of the measure by evaluating its effect on firm's financial performance. Nomological validity examines the degree to which inferences can be made from the operationalization of a study to the theoretical construct on which those operationalizations are based. Predictive validity is the extent to which a test can predict scores on some criterion measure (Cronbach and Meehl, 1955). The additional structural analysis followed the guidelines suggested by Gefen *et al.*, (2000) and Petter *et al.* (2007).

The financial performance measures used in this study were ROA (Return on Assets) and ROE (Return on Equity).

Table 7 Structural analysis of Hypotheses H1a to H1f

Path	*(Weight) Value*	*Standard error*	*t stat*	*P-value*
Communication → SAM	0.231	0.016	14.487	<0.001
Value analytics → SAM	0.294	0.018	16.505	<0.001
IT governance → SAM	0.236	0.013	17.943	<0.001
Partnership → SAM	0.268	0.016	17.025	<0.001
IT scope → SAM	0.236	0.018	13.164	<0.001
Skills/HR → SAM	0.289	0.019	15.616	<0.001

Figure 2 The research model: results.

Table 8 Regression of alignment dimensions on company performance

Path	*Coefficient*	*t-stat*	*P-value*
Communication → Company Performance	0.029	0.331	0.741
Value analytics → Company Performance	0.112	1.270	0.205
IT governance → Company Performance	0.042	0.447	0.655
Partnership → Company Performance	0.067	0.674	0.501
IT Scope → Company Performance	0.050	0.555	0.580
Skills/HR → Company Performance	0.135	1.550	0.122

Both ROA and ROE are often used in research to measure company performance (see Tai, 2008; Yu *et al.*, 2009; Haslam *et al.*, 2010). The choice of ROA and ROE as performance indicators was preferred, because these measures assess the company's performance regardless of the company size and industry. Furthermore, ROE is recognized as a measure of company quality and most introductory investments textbooks emphasize that ROE is a critical fundamental variable that investors should consider when making an investment in a company (Fuller *et al.*, 2014). In addition, ROA and ROE ratios are applied by management to make strategic decisions that affect the company structure and profitability, including as primary vehicles for stock portfolio investments. Notwithstanding, other measures of performance are also used in the literature and the limitation of using ROA and ROE is presented later when the limitations of this study are discussed.

The performance measures, ROA and ROE, were obtained through secondary sources: annual reports obtained from various resources, including publicly published reports, such as Google Finance, Yahoo Finance, and so on. Consequently, an additional path, leading to ROA and to ROE, was applied to the endogenous construct to demonstrate its nomological and predictive validity.

The impact of the IT-business alignment construct on the company performance was significant (P-value<0.001, $\beta = 0.387$, t-stat = 7.94), with Cohen's effect size, $f_2 = 0.176$, (Cohen, 1988) being medium to moderate (see Figure 2). Overall, alignment explains 15% of the company performance ($R^2 = 15\%$) and is comparable to values reported in previous studies where the effect of a single factor on company performance was assessed (e.g., Chan *et al.*, 2006; Tanriverdi, 2006). The cross-validated redundancy measure (also known as the Stone-Geisser Test) ascertained that the model had predictive relevance with a Q^2 value = 0.09 that is above the threshold value of 0 (Vinzi *et al.*, 2010). These results validate the predictive and nomological validity of the proposed construct.

To further evaluate the relationship and validate H2, the impact of each of the six dimensions on firm performance was assessed independently using a simple regression. The regressions showed statistically insignificant results for each dimension (see Table 8) demonstrating that the impact of IT-business alignment on company performance is constituted by the proper amalgamation of all six activities while separately they do not have a significant effect on performance. This provides *support* for *H2*.

Discussion and conclusions

Achieving and sustaining IT-business alignment remains a persistent and pervasive management concern. This study examined and presented ways of influencing this alignment and the important relationship between alignment and firm performance. The study is novel in that it identifies major components (a.k.a. activity dimensions) that influence the level of IT-business alignment. By doing so it offers a comprehensive activity-based characterization of IT-business alignment that goes beyond the current perception-based or fit-based measurements of the *state* of alignment across abstract dimensions.

Several previous studies have sought to address the alignment conundrum (see for example, Bergeron *et al.*, 2004; Hu and Huang, 2005; Gerow *et al.*, 2014, for a summary see Coltman *et al.*, 2015) and provided progress in measuring the level of alignment and its impact on performance. As reviewed, they have several challenges. Many of them are conceptual or include static or abstract scales to evaluate alignments. In this regard their results may be biased because of inadequate measures. In addition, these studies do not offer effective practical tools to assist IT and business executives in identifying ways to improve alignment.

The proposed SAM model seeks to address some of these challenges by focusing on activities that contribute to alignment and assessing/measuring their scope and extent. By doing so it provides new empirical evidence on how well companies are achieving alignment. In addition, this work carefully delineates the scope and extent of alignment activities whereby the IT function and other business functions can mutually engage in and coordinate their work to improve the alignment. The uniqueness of this model is the focus and investigation on micro-level dynamic capabilities that support IT-business alignment. To this end, it identifies a large set of activities that need to be shared across functional areas and that are likely to improve the state of alignment. The research also demonstrates that successful alignment should focus on a larger collection of activities that IT managers and business managers need to carry out jointly as to coordinate goals and operations within IT and across other organizational functions (e.g., finance, marketing, HR).

The study confirms that communication activities (e.g., understanding of business by IT, Understand of IT by business), value analytics activities (e.g., IT and business metrics), IT governance activities (e.g., strategic planning, reporting, budgeting), partnership activities (e.g., maintaining working relationship between business and IT organizations), IT scoping activities (e.g., promoting the creation of a flexible IT infrastructure, its evaluation and application of emerging technologies, driving business process change, and delivering valuable customized solutions), and positioning and balancing business and IT skills *all* form a part of the IT-Business alignment. In addition, the study shows that the level of strategic alignment, when expressed as a joint formative construct of these six alignment dimensions, has a moderate positive impact on company performance.

Despite these encouraging results the model has still several limitations that also plague significant portions of the

alignment literature. First, it did not model or analyze additional political, cognitive or environmental factors that may influence the level of alignment (as moderators) or to what extent the level of alignment influences firm performance. Such studies are sorely needed and should be addressed in the future applications of SAM. Second, though all steps were taken to guarantee the completeness and disjointness of the dimensions of SAM and related activities by conducting literature review, and validating the face and content validity of the dimensions in the field settings, there is no way of ensuring that some possible important dimension has been omitted. These two limitations are also the principal weakness of the SEM approach: since SEM is a confirmatory technique, a full model, including all of the relationships, had to be specified *a priori* and tested based on the data and the variables included in the measurements; the SEM modeling technique cannot reveal new dimensions or factors that impact the level of alignment.

This issue can be addressed in future research in two ways. First a better theoretical model of alignment capabilities and their value adding, non-substitutable, and complementary properties need to be established founded on theories of dynamic capabilities (for some recent suggestions in this regard see Coltman *et al.*, 2015). Second, there needs to be more exploratory and inductive research to identify/examine alternative sets of capabilities.

Other limitations relate to the data collection method. As indicated above, the majority (80%) of the data collected in this study was based on interviews and group discussion to obtain a consensus, and the remaining data was obtained via questionnaires. While both interviews and questionnaires are popular data collection methods in this field, they do not necessarily accurately represent the various IT alignment approaches in the industry, as some biases may transpire. For example, as free expression of executives' opinions on alignment were solicited for this study, executives from different companies or industries may hold a different understanding of the measures and the terms used in the interviews and the questionnaire. Also, since the data was collected over a 13-year period, understanding of IT alignment today may be different than the way it was viewed 13 years ago, albeit the data collected over this time period (especially when evaluating the same company) clearly demonstrates the overall improvement in alignment maturity (e.g., organizations are getting better at understand and improving this important relationship). Using the research methods used in this work would surely produce subjective results, and thus, some bias may exist. Moreover, although ROA and ROE are popular/accepted performance measures (the reasons for choosing them were discussed above), other measure of performance also appear in the literature and different stakeholders (customers, vendors, shareholders) may use different measurements of performance (Venkatraman and Ramanujam, 1986). Yet, many of those other performance measures could be classified as industry-specific, short-term quantitative measures of performance (Palmer and Markus, 2000), for example, sales growth, return on sales, earnings per share, and operational performance. Finally, the analysis of predictive and nomological validity is fraught with typical problems of survey-based designs in establishing causality – the direction cannot be established without control group or instrumental variables and the design can be biased because of omitted variables. Therefore no strong claims are made with regard to actual effects of alignment levels of firm performance based on our analysis they are significantly correlated and the size effect is similar or higher to most other studies that examined the value adding effects of IT.

The analysis in this work explains 15% of the overall company performance, that is, the proportion of variability of the response data explained by the model was 15%. This indicates that there are several additional elements, not considered in this study (and perhaps not attributable to IT and alignment) that constitute the performance construct. As such this is not surprising. Other factors, for example, the competition or effectiveness of other business activities such as operations, marketing, or research, would explain (at least in part) the remaining 85%. Nevertheless, this result is important, because it represents a statistically significant and reliable relationship between IT-business alignment and company performance. In an age of small profit margins (less than 5% in most industries), this research indicates that a leverage of 15% is explained by IT-business alignment, hence it likely does produce strategies that augment company performance.

Overall, the study opens a new horizon to leverage IT value. Essentially, contrary to past research, the study provides a comprehensive vehicle to benchmark where an organization stands in its alignment and perhaps more importantly, how it can improve its IT-business relationships and performance. The evaluation of a company's alignment status is a fundamental step in identifying actions necessary for enhancing the congruent relationship between business and IT, and to ensure that IT is being leveraged to provide value to the business. Executives can use these results to articulate more comprehensive action plans for attaining greater IT-business alignment thus enhancing IT's effect on the business.

Since the empirical study was able to support the stated hypotheses, it would also be reasonable to conclude that additional responses and performance variables would increase the model accuracy. Future research should consider collecting additional performance data including new financial data (earning per share), customer benefit (customer satisfaction/retention), productivity, and industry specific measurements. In addition to performance data, future research should consider focusing on related business-IT alignment aspects, like strategic fit with regard to turbulence, business cycle, governance structure, or national/cultural differences. This would help attain a richer perspective of IT-business alignment and its relationships. As new data is collected investigations can detect new interactions among the measures allowing scholars to gain insights on various IT-business interactions. For example, a consultant would be able to assist a client in deciding where and how to intervene to improve strategic alignment and what relative effect it would have. This prospective line of research would enhance the application of the proposed SAM model as a prescriptive tool to better leverage effective IT services.

Notes

1 This is not to be confused with the Henderson and Venkatraman (1993) Strategic Alignment Model (SAM).

2 As for all formative constructs the completeness of these six dimensions is a key concern (Podsakoff *et al.,* 2012). We address this with normal proposed methods of theoretical triangulation

and related sampling of constructs and field studies that reviewed dimensions that influence alignment and business-IT coordination. This does not naturally guarantee that additional dimensions do not influence alignment,

3 Similar results were obtained on the item level for each dimension.

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Appendix A

Questionnaire instrument

The following is the questionnaire used (primarily as an interview or group discussion guide; over 80% of the data was collected via interviews) to assess SAM's six dimensions. Parts II through VII of this questionnaire assess the firm's current level of strategic alignment maturity by measuring responses to items related to IT and business organizations, as follows:

Communications	(Part II)
Competency and value of IT	(Part III)
IT governance decisions	(Part IV)
Partnerships	(Part V)
IT infrastructure	(Part VI)
Skills resources	(Part VII)

For each of the questions in these sections, the respondents were asked to choose the one response that most closely represented their opinion of the effectiveness of their organization's management practices and strategic choices. If they were unsure how to answer a question without guessing, or if the item was not applicable to their organization, they were asked to mark the 'N/A or don't know' box.

Part II: Effectiveness of IT and business communications

1. To what extent does IT understand the organization's business environment (e.g., its customers, competitors, processes, partners/alliances):

1. ☐ Senior and mid-level IT managers do not understand the business.
2. ☐ Senior and mid-level IT managers have a limited understanding of the business.
3. ☐ Senior and mid-level IT managers have a good understanding of the business.
4. ☐ Understanding of the business by all IT members is encouraged and promoted by senior managers.
5. ☐ Understanding of the business is required (e.g., tied to performance appraisals) throughout the IT function.
6. ☐ N/A or don't know

2. To what extent do the business organizations understand the IT environment (e.g., its current and potential capabilities, systems, services, processes):

1. ☐ Senior and mid-level business managers do not understand IT.
2. ☐ Senior and mid-level business managers have a limited understanding of IT.
3. ☐ Senior and mid-level business managers have a good understanding of IT.
4. ☐ Understanding of IT by all employees is encouraged and promoted by senior management.
5. ☐ Understanding of IT is required (e.g., tied to performance appraisals) throughout the business.
6. ☐ N/A or don't know

3. The following statements pertain to methods (e.g., intranets, bulletin boards, education, meetings, e-mail) in place to promote organizational education/learning (e.g., of experiences, problems, objectives, critical success factors). Organizational learning occurs primarily through:

1. ☐ Ad-hoc/casual methods (employee observation, anecdote sharing, peer meetings, etc.)
2. ☐ Informal methods (newsletters, bulletin board notices, computer reports, group e-mail, fax, etc.)
3. ☐ Regular, clear methods (training, e-mail, phone-mail, intranet, department meetings, etc.) from mid-level management
4. ☐ Formal, unifying, bonding methods from senior *and* mid-level management
5. ☐ Formal, unifying, bonding methods from senior and mid-level management, *with feedback* measures to monitor and promote effectiveness of learning
6. ☐ N/A or don't know

4. The following question pertains to communications protocol. The IT and business communication style (e.g., ease of access, familiarity of stakeholders) tends to be:

1. ☐ One-way, from the business; formal and inflexible
2. ☐ One-way, from the business; moderately informal and moderately flexible
3. ☐ Two-way; formal and inflexible
4. ☐ Two-way; moderately informal and moderately flexible
5. ☐ Two-way; informal and flexible
6. ☐ N/A or don't know

5. The following statements pertain to the extent in which there is knowledge sharing (intellectual understanding and appreciation of the problems/opportunities, tasks, roles, objectives, priorities, goals, direction, etc.) between IT and business:

1. ☐ Knowledge sharing is on an ad-hoc basis.
2. ☐ Knowledge sharing is somewhat structured and/or structure is beginning to be created.
3. ☐ There is structured sharing around key functional unit processes.
4. ☐ There is formal sharing at the functional unit level *and* at the corporate level.
5. ☐ There is formal sharing at the functional unit level, at the corporate level, *and* with business partners/alliances.
6. ☐ N/A or don't know

6. The following statements pertain to the role and effectiveness of IT and business liaisons:

1. ☐ We do not use liaisons, or if we do, we do so on an ad-hoc, as needed basis.
2. ☐ We regularly use liaisons to transfer IT knowledge to the business and business knowledge to IT. They are the primary contact point for interactions between IT and the business. Liaisons *are not* usually used to facilitate relationship development.
3. ☐ We regularly use liaisons to transfer IT knowledge to the business and business knowledge to IT. *T*hey occasionally facilitate relationship development.

4. ☐ We regularly use liaisons to facilitate the transfer of IT knowledge to the business and business knowledge to IT. Their primary objective is to facilitate internal relationship development.
5. ☐ We regularly use liaisons to facilitate the transfer of IT knowledge to the business and external partners and business knowledge to IT. Their primary objective is to facilitate relationship development across the business and its external partners.
6. ☐ N/A or don't know

Part III: Measurement of the competency and value of IT

7. The following statements pertain to the metrics and processes used to measure ITs contribution to the business.

1. ☐ The metrics and processes we have in place to measure IT are primarily technical (e.g., system availability, response time).
2. ☐ We are equally concerned with technical *and* cost efficiency measures. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.
3. ☐ We formally assess technical and cost efficiency using traditional financial measures, such as return on investment (ROI) and activity-based costing (ABC). We are starting to put formal feedback processes in place to review and take action based on the results of our measures.
4. ☐ We formally assess technical, cost efficiency, and cost effectiveness using traditional financial measures (e.g., ROI, ABC). We have formal feedback processes in place to review and take action based on the results of our measures.
5. ☐ We use a multi-dimensional approach with appropriate weights given to technical, financial, operational, and human-related measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).
6. ☐ N/A or don't know

8. The following statements pertain to the use of business metrics to measure contribution to the business.

1. ☐ We do not measure the value of our business investments, or do so on an ad-hoc basis.
2. ☐ We are concerned with cost efficiency measures at the functional organization level only. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.
3. ☐ We formally use traditional financial measures, such as return on investment (ROI) and activity-based costing (ABC), across functional organizations. We are starting to have formal feedback processes in place to review and take action based on the results of our measures.
4. ☐ We formally measure value based on the contribution to our customers. We have formal feedback processes in place to review and take action based on the results of our measures and to assess contributions across functional organizations.
5. ☐ We use a multi-dimensional approach with appropriate weights given to technical, financial, operational, and human-related measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).
6. ☐ N/A or don't know

9. The following statements pertain to the use of integrated IT and business metrics to measure ITs contribution to the business.

1. ☐ We do not measure the value of our IT business investments, or do so on an ad-hoc basis.
2. ☐ The value measurements for IT and business are not linked. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.
3. ☐ The value measurements for IT and business are starting to be linked and formalized. We are also starting to have formal feedback processes in place to review and take action based on the results of our measures.
4. ☐ We formally link the value measurements of IT and business. We have formal feedback processes in place to review and take action based on the results of our measures and to assess contributions across functional organizations.
5. ☐ We use a multi-dimensional approach with appropriate weight given to IT and business measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).
6. ☐ N/A or don't know

10. The following statements pertain to the use of service level agreements (SLAs):

1. ☐ We do not use SLAs or do so sporadically.
2. ☐ We have SLAs which are primarily technically oriented (response time, length of computer downtime, etc.), between the IT and functional organizations.
3. ☐ We have SLAs which are both technically oriented and relationship-oriented (user/customer satisfaction, IT's commitment to the business, etc.) that are between the IT and functional organizations and also emerging across the enterprise.
4. ☐ We have SLAs which are both technically-oriented and relationship-oriented, between the IT and functional organizations as well as enterprise wide.
5. ☐ We have SLAs which are both technically-oriented and relationship-oriented, between the IT and functional organizations as well as at enterprise wide and with our external partners/alliances.
6. ☐ N/A or don't know

11. The following statements pertain to benchmarking practices. *Informal* practices are such things as informal interviews, literature searches, company visits, etc., while *formal* practices are such things as environmental scanning, data gathering and analysis, determining best practices, etc.

1. ☐ We seldom or never perform either informal or formal benchmarks.

2. ☐ We occasionally or routinely perform informal benchmarks.
3. ☐ We occasionally perform formal benchmarks and seldom take action based on the findings.
4. ☐ We routinely perform formal benchmarks and usually take action based on the findings.
5. ☐ We routinely perform formal benchmarks and have a regulated process in place to take action and measure the changes.
6. ☐ N/A or don't know

12. The following statements pertain to the extent of assessment and review of IT investments.

1. ☐ We do not formally assess and/or review.
2. ☐ We assess and/or review only after we have a business or IT problem (i.e., failed IT project, market share loss).
3. ☐ Assessments and/or reviews are becoming routine occurrences.
4. ☐ We routinely assess and/or review and have a formal process in place to make changes based on the results.
5. ☐ We routinely assess and/or review and have a formal process in place to make changes based on the results and measure the changes. Our external partners are included in the process.
6. ☐ N/A or don't know

13. The following statements pertain to the extent to which IT-business continuous improvement practices (e.g., quality circles, quality reviews) and effectiveness measures are in place.

1. ☐ We do not have any continuous improvement practices in place.
2. ☐ We have a few continuous improvement practices in place, but no effectiveness measures are in place.
3. ☐ We have a few continuous improvement practices in place and the use of effectiveness measures is emerging.
4. ☐ We have many continuous improvement practices in place and we frequently measure their effectiveness.
5. ☐ We have well established continuous improvement practices and effectiveness measures in place.
6. ☐ N/A or don't know

14. The demonstrated contribution that the IT function has made to the accomplishment of the organization's strategic goals is:

1. ☐ Very weak
2. ☐ Somewhat weak
3. ☐ Neither weak nor strong
4. ☐ Somewhat strong
5. ☐ Very strong
6. ☐ N/A or don't know

Part IV: IT governance

15. The following statements pertain to strategic business planning with IT participation.

1. ☐ We do no formal strategic business planning or, if it is done, it is done on an as-needed basis.
2. ☐ We do formal strategic business planning at the functional unit level with slight IT participation.
3. ☐ We do formal strategic business planning at the functional unit levels with some IT participation. There is some inter-organizational planning.
4. ☐ We do formal strategic business planning at the functional unit and across the enterprise with IT participation.
5. ☐ We do formal strategic business planning at the functional unit, across the enterprise, and with our business partners/alliances with IT participation.
6. ☐ N/A or don't know

16. The following statements pertain to strategic IT planning with business participation.

1. ☐ We do no formal strategic IT planning or, if it is done, it is done on an as-needed basis.
2. ☐ We do formal strategic IT planning at the functional unit level with slight business participation.
3. ☐ We do formal strategic IT planning at the functional unit levels with some business participation. There is some inter-organizational planning.
4. ☐ We do formal strategic IT planning at the functional unit and across the enterprise with the business.
5. ☐ We do formal strategic business planning at the functional unit, across the enterprise, and with our business partners/alliances.
6. ☐ N/A or don't know

17. The following statements pertain to IT budgeting. Our IT function is budgeted as a:

1. ☐ Cost center, with erratic/inconsistent/irregular/changeable spending
2. ☐ Cost center, by functional organization
3. ☐ Cost center with some projects treated as investments
4. ☐ Investment center
5. ☐ Profit center, where IT generates revenues
6. ☐ N/A or don't know

18. The following statements pertain to IT investment decisions. Our IT investment decisions are primarily based on IT's ability to:

1. ☐ Reduce costs.
2. ☐ Increase productivity and efficiency as the focus.
3. ☐ Traditional financial reviews. IT is seen as a process enabler.
4. ☐ Business effectiveness is the focus. IT is seen as a process driver or business strategy enabler.
5. ☐ Create competitive advantage and increase profit. Our business partners see value.
6. ☐ N/A or don't know

19. The following statements pertain to IT steering committee (s) with senior level IT and business management participation.

1. ☐ We do not have formal/regular steering committee(s).
2. ☐ We have committee(s) which meet informally on an as-needed basis.
3. ☐ We have formal committees, which meet regularly and have emerging effectiveness.
4. ☐ We have formal, regular committee meetings with demonstrated effectiveness.
5. ☐ We have formal, regular committee meetings with demonstrated effectiveness that include strategic business partners sharing decision-making responsibilities.
6. ☐ N/A or don't know

20. The following statements pertain to how IT projects are prioritized. Our IT project prioritization process is usually:

1. ☐ In reaction to a business or IT need.
2. ☐ Determined by the IT function.
3. ☐ Determined by the business function.
4. ☐ Mutually determined between senior and mid-level IT and business management.
5. ☐ Mutually determined between senior and mid-level IT and business management and with consideration of the priorities of any business partners/alliances.
6. ☐ N/A or don't know

21. The ability of the IT function to react/respond quickly to the organization's changing business needs is:

1. ☐ Very weak
2. ☐ Somewhat weak
3. ☐ Neither weak nor strong
4. ☐ Somewhat strong
5. ☐ Very strong
6. ☐ N/A or don't know

Part V: Partnerships between IT and business functions

22. IT is perceived by the business as:

1. ☐ A cost of doing business
2. ☐ Emerging as an asset
3. ☐ A fundamental enabler of future business activity
4. ☐ A fundamental driver of future business activity
5. ☐ A partner with the business that co-adapts/improvises in bringing value to the firm
6. ☐ N/A or don't know

23. The following statements pertain to the role of IT in strategic business planning.

1. ☐ IT does not have a role.
2. ☐ IT is used to enable business processes.
3. ☐ IT is used to drive business processes.
4. ☐ IT is used to enable or drive business strategy.
5. ☐ IT co-adapts with the business to enable/drive strategic objectives.
6. ☐ N/A or don't know

24. The following statements pertain to the sharing (by IT and business management) of the risks and rewards (e.g., bonuses) associated with IT-based initiatives (i.e., a project is late and over budget because of business requirement changes).

1. ☐ IT takes all the risks and does not receive any of the rewards.
2. ☐ IT takes most of the risks with little reward.
3. ☐ Sharing of risks and rewards is emerging.
4. ☐ Risks and rewards are always shared.
5. ☐ Risks and rewards are always shared and we have formal compensation and reward systems in place that induce managers to take risks.
6. ☐ N/A or don't know

25. The following statements pertain to formally managing the IT/business relationship. To what extent are there formal processes in place that focus on enhancing the partnership relationships that exist between IT and business (e.g., cross-functional teams, training, risk/reward sharing):

1. ☐ We don't manage our relationships.
2. ☐ We manage our relationships on an ad-hoc basis.
3. ☐ We have defined programs to manage our relationships, but IT or the business does not always comply with them. Conflict is seen as creative rather than disruptive.
4. ☐ We have defined programs to manage our relationships and both IT and the business comply with them.
5. ☐ We have defined programs to manage our relationships, both IT and the business comply with them, and we are continuously improving them.
6. ☐ N/A or don't know

26. The following statements pertain to IT and business relationship and trust.

1. ☐ There is a sense of conflict and mistrust between IT and the business.
2. ☐ The association is primarily an 'arm's length' transactional style of relationship.
3. ☐ IT is emerging as a valued service provider.
4. ☐ The association is primarily a long-term partnership style of relationship.
5. ☐ The association is a long-term partnership and valued service provider.
6. ☐ N/A or don't know

27. The following statements pertain to business sponsors/champions. Our IT-based initiatives:

1. ☐ Do not usually have a senior level IT or business sponsor/champion.
2. ☐ Often have a senior level IT sponsor/champion only.
3. ☐ Often have a senior level IT and business sponsor/champion at the functional unit level.
4. ☐ Often have a senior level IT and business sponsor/champion at the corporate level.
5. ☐ Often have a senior level IT and the CEO as the business/sponsor champion.
6. ☐ N/A or don't know

Part VI: Scope and architecture of the IT infrastructure

28. The following statements pertain to the scope of your IT systems. Our primary systems are:

1. ☐ Traditional office support (e.g., e-mail, accounting, word processing, legacy systems)
2. ☐ Transaction-oriented (e.g., back office support)
3. ☐ Business process enablers (IT supports business process change)
4. ☐ Business process drivers (IT is a catalyst for business process change)
5. ☐ Business strategy enablers/drivers (IT is a catalyst for changes in the business strategy)
6. ☐ N/A or don't know

29. The following statements pertain to the articulation of and compliance with IT standards. Our IT standards are:

1. ☐ Non-existent or not enforced
2. ☐ Defined and enforced at the functional unit level but not across different functional units

3. ☐ Defined and enforced at the functional unit level with emerging coordination across functional units
4. ☐ Defined and enforced across functional units
5. ☐ Defined and enforced across functional units, and with joint coordination among our strategic business partners/alliances
6. ☐ N/A or don't know

30. The following statements pertain to the scope of architectural integration. The components of our IT infrastructure are:

1. ☐ Not well integrated
2. ☐ Integrated at the functional unit with emerging integration across functional units
3. ☐ Integrated across functional units
4. ☐ Integrated across functional units and our strategic business partners/alliances
5. ☐ Evolving with our business partners
6. ☐ N/A or don't know

31. The following statements pertain to the level of disruption caused by business and IT changes (e.g., implementation of a new technology, business process, and merger/acquisition). Most of the time, a business or IT change is:

1. ☐ Not readily transparent (very disruptive)
2. ☐ Transparent at the functional level only
3. ☐ Transparent at the functional level and emerging across all remote, branch, and mobile locations
4. ☐ Transparent across the entire organization
5. ☐ Transparent across the organization and to our business partners/alliances
6. ☐ N/A or don't know

32. The following statements pertain to the scope of IT infrastructure flexibility to business and technology changes. Our IT infrastructure is viewed as:

1. ☐ A utility providing the basic IT services at minimum cost
2. ☐ Emerging as driven by the requirements of the current business strategy
3. ☐ Driven by the requirements of the current business strategy
4. ☐ Emerging as a resource to enable fast response to changes in the marketplace
5. ☐ A resource to enable and drive fast response to changes in the marketplace
6. ☐ N/A or don't know

Part VII: Human resource skills

33. The following statements pertain to the extent the organization fosters an innovative entrepreneurial environment. Entrepreneurship is:

1. ☐ Discouraged
2. ☐ Moderately encouraged at the functional unit level
3. ☐ Strongly encouraged at the functional unit level
4. ☐ Strongly encouraged at the functional unit and corporate levels
5. ☐ Strongly encouraged at the functional unit, corporate level, and with business partners/alliances
6. ☐ N/A or don't know

34. The following statements pertain to the cultural locus of power in making IT-based decisions. Our important IT decisions are made by:

1. ☐ Top business management or IT management at the corporate level only
2. ☐ Top business or IT management at corporate level with emerging functional unit level influence
3. ☐ Top business management at corporate and functional unit levels, with emerging shared influence from IT management
4. ☐ Top management (business and IT) across the organization and emerging influence from our business partners/alliances.
5. ☐ Top management across the organization with equal influence from our business partners/alliances.
6. ☐ N/A or don't know

35. The following statements pertain to your organization's readiness for change.

1. ☐ We tend to resist change.
2. ☐ We recognize the need for change and change readiness programs are emerging.
3. ☐ Change readiness programs providing training and necessary skills to implement change are in place at the functional unit level.
4. ☐ Change readiness programs are in place at the corporate level.
5. ☐ Change readiness programs are in place at the corporate level and we are proactive and anticipate change.
6. ☐ N/A or don't know

36. The following statements pertain to career crossover opportunities among IT and business personnel.

1. ☐ Job transfers rarely or never occur.
2. ☐ Job transfers occasionally occur within the functional organization.
3. ☐ Job transfers regularly occur for management level positions usually at the functional level.
4. ☐ Job transfers regularly occur for all position levels and within the functional units.
5. ☐ Job transfers regularly occur for all position levels, within the functional units, and at the corporate level.
6. ☐ N/A or don't know

37. The following statements pertain to employee opportunities to learn about and support services outside the employee's functional unit (e.g., programmers trained in product/service production functions, customer service trained in systems analysis) using programs such as cross training and job rotation. The organization:

1. ☐ Does not provide opportunities to learn about support services outside the employee's functional unit.
2. ☐ Opportunities are dependent on the functional unit.
3. ☐ Formal programs are practiced by all functional units.
4. ☐ Formal programs are practiced by all functional units and across the enterprise.
5. ☐ Opportunities are formally available across the enterprise and with business partners/alliances.
6. ☐ N/A or don't know

38. The following statements pertain to the interpersonal interaction (e.g., trust, confidence, cultural, social, and political environment) that exists across IT and business units in our organization.

1. ☐ There is minimum interaction between IT and business units.
2. ☐ The association is primarily an 'arm's length' transactional style of relationship.
3. ☐ Trust and confidence among IT and business is emerging.
4. ☐ Trust and confidence among IT and business is achieved.
5. ☐ Trust and confidence is extended to external customers and partners.
6. ☐ N/A or don't know

39. The following statements pertain to the IT organization's ability to attract and retain the best business and technical professionals.

1. ☐ There is no formal program to retain IT professionals. Recruiting demands are filled ineffectively.
2. ☐ IT hiring is focused on technical expertise.
3. ☐ IT hiring is focused equally on technical and business expertise. Retention programs are in place.
4. ☐ Formal programs are in place to attract and retain the best IT professionals with both technical and business skills.
5. ☐ Effective programs are in place to attract and retain the best IT professionals with both technical and business skills.
6. ☐ N/A or don't know

Note: We also include two additional questions pertaining to where the CIO reports and the organizational structure of IT.

Appendix B

List of it and business related activities

The following is a list of IT and business related activities (the initial and the number before each activity are later used in the construct):

C1 Understanding of Business by IT
C2 Understanding of IT by Business
C3 Inter-organizational Learning/Education
C4 Protocol Rigidity
C5 Knowledge Sharing
C6 Liaison Effectiveness
M1 IT metrics
M2 Business Metrics
M3 Integrated IT and Business metrics
M4 Service Level Agreements
M5 External Benchmarking
M6 Formal Assessments/Reviews
M7 Continuous Improvement
M8 IT function contribution
G1 Business Strategic Planning
G2 IT Strategic Planning
G3 IT Organizational Structure
G4 IT Reporting
G5 IT Budgeting
G6 IT Investment Decisions
G7 Steering committee
G8 IT Prioritization Process
G9 IT Reaction Capacity
P1 Business Perception of IT Value
P2 Role of IT in Strategic Business Planning
P3 Shared Goals, Risk, Rewards/Penalties
P4 T Program Management
P5 Relationship/ Trust Style
P6 Business Sponsor/Champion
A1 Traditional, Enabler/Driver, External
A2 Standards Articulation
A3 Architectural Integration
A4 Architectural Transparency to Changes
A5 IT infrastructure flexibility
S1 Innovative Entrepreneurial Environment
S2 Cultural Locus of Power
S3 Change Readiness
S4 Career Crossover
S5 Training/Talent improvement to Learn
S6 Interpersonal Interaction
S7 Hiring and Retaining

Appendix C

Table C1 Sam's dimensions and items

Dimension Definition	*Items*
Communications measures the level and effectiveness of the exchange of ideas, knowledge, and information between IT and business organizations that enables both to understand the respective strategies, plans, business and IT environments, risks, priorities	C1 – Understanding of Business by IT C2 – Understanding of IT by Business C3 – Inter-organizational Learning/Education C4 – Protocol Rigidity C5 – Knowledge Sharing C6 – Liaison Effectiveness
Value Analytics taps into the level of using metrics to demonstrate the contributions of IT and the IT organization to the business in ways that both the business and IT understand and accept	M1 – IT metrics M2 – Business Metrics M3 – Integrated IT and Business metrics M4 – Service Level Agreements M5 – External Benchmarking M6 – Formal Assessments/Reviews M7 – Continuous Improvement M8 – IT function contribution
IT Governance defines formal processes around IT decisions and the level of discipline that IT and business manager's use at strategic, tactical, and operational levels in setting IT priorities and allocating IT resources	G1 – Business Strategic Planning G2 – IT Strategic Planning G3 – IT Organizational Structure G4 – IT Reporting G5 – IT Budgeting G6 – IT Investment Decisions G7 – Steering committee G8 – IT Prioritization Process G9 – IT Reaction Capacity
Partnering gauges the scope and level of activities to maintain working relationships between business and IT organizations, the degree of trust and how each perceives the other's contribution	P1 – Business Perception of IT Value P2 – Role of IT in Strategic Business Planning P3 – Shared Goals, Risk, Rewards/Penalties P4 – T Program Management P5 – Relationship/Trust Style P6 – Business Sponsor/Champion
IT Scope measures the level of IT's provisioning activities that promote creation of a flexible IT infrastructure, evaluation and application of emerging technologies, activities that drive business process change, and activities that deliver innovative customized solutions to business units	A1 – Traditional, Enabler/Driver, External A2 – Standards Articulation A3 – Architectural Integration A4 – Architectural Transparency to Changes A5 – IT infrastructure flexibility
IT skills captures critical human resource activities, such as hiring, retention, training, performance feedback, innovation encouragement, career opportunities, and individual skill development. It also covers activities that promote to IT organization's readiness for change, learning, and ability to leverage new ideas.	S1 – Innovative Entrepreneurial Environment S2 – Cultural Locus of Power S3 – Change Readiness S4 – Career Crossover S5 – Training/Talent improvement to Learn S6 – Interpersonal Interaction S7 – Hiring and Retaining