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Assessing the Connections among Top Management Support, IT Assimilation, and the Business Value of IT: A Meta-Analysis

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Abstract

Scholars and practitioners have long tried to understand the antecedents and consequences of information technology (IT) assimilation. Studies suggest that top management support is an important driver of IT assimilation; however, this broad takeaway provides little substantive guidance to researchers and practitioners. We also have a limited understanding of whether and when IT assimilation creates business value. We take stock of this literature with a meta-analysis. We found that top management support is positively related to IT assimilation, and assimilation is in turn positively related to the business value of IT. We also found that explicit support does not have any special effect on IT assimilation (compared to implicit support) and may not be related to business value at all. However, our results indicate that IT assimilation has a stronger effect on business value at the process level (versus firm level) and for enterprise IT innovations (versus function IT innovations). Finally, we found that support-assimilation and assimilation-value relationships are stronger in high (versus low) power distance cultures. Our collective findings can facilitate future research and help practitioners navigate IT assimilation initiatives.

Keywords: Assimilation, Innovation, Top Management Support, IT Value, Meta-Analysis

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1 Introduction

Organizations often fail to extract value from information technology (IT) innovations[1] that they adopt but do not extensively assimilate in their processes and routines (Fichman & Kemerer, 1997; Purvis et al., 2001; Swanson & Ramiller, 2004). Thus, practitioners and academics have long tried to understand whether, when, and how organizations assimilate IT innovations (Fichman, 2000). Broadly speaking, assimilation refers to the degree to which the use of technology diffuses across organizational processes and becomes routinized in the activities of those processes. Assimilation presents significant challenges, and assimilation efforts often result in limited success (Barker & Frolick, 2003; Grossman & Walsh, 2004). Researchers generally agree that top management support facilitates assimilation initiatives (Barczak et al., 2007; Chatterjee et al., 2002; Rai et al., 2009; Wolf et al., 2012). Management[2] can express their beliefs regarding how a technology is salient to the organization's mission and goals (Liang et al.,

[1] We define IT innovation as the pursuit of IT-based processes or products new to an organization (Swanson & Ramiller, 2004).

[2] For the sake of brevity, we use the terms "top management" and "management" interchangeably in this paper.

2007), they can allocate resources toward assimilation initiatives (Premkumar & Ramamurthy, 1995), and they can act as assimilation champions (Saini et al., 2010). The basic takeaway from this literature is that top management support facilitates the assimilation of IT in organizational processes and routines, thereby improving the odds that the organization will extract value from the IT innovation.

With this in mind, it may be tempting to simply instruct managers to support every IT assimilation initiative in their organization. However, management time and attention are finite resources (Helfat & Peteraf, 2015; Ocasio, 2011). Though it may be helpful for management to articulate a vision, formulate a strategy, and establish goals for every adopted technology that comes along, we cannot reasonably expect them to do so given competing interests and priorities. Some studies suggest that managers should act as champions who explicitly promote IT innovations in a way that encourages assimilation (Barczak et al., 2007; Germann et al., 2013; Gunasekaran et al., 2017). Yet explicit, active support may require tremendous time and energy (Howell & Higgins, 1990) and may be directed toward IT innovations that are not in the organization's best interest (Gogan et al., 2020). Explicit support arguably demands more time, energy, and attention than implicit support (e.g., symbolic actions); hence, it would be helpful to know if the way that management manifests its support has differential effects on IT assimilation and business value.

Other studies emphasize the importance of top management support for enterprise-wide IT innovations such as enterprise resource planning (ERP) systems (Dezdar & Ainin, 2011; Law & Ngai, 2007). These innovations typically affect more organizational stakeholders and require more resources than innovations that do not span the enterprise (Markus & Tanis, 2000). This suggests that the effect of management support may not be as strong for function-level IT innovations (e.g., e-procurement). Yet we have little understanding of whether the effects of top management support on IT assimilation and business value vary by the innovation scope (enterprise versus function). Despite the wealth of research on top management support and IT assimilation, most of our takeaways from this literature lack nuance and are at the surface level. As a result, it is difficult to provide substantive guidance to practitioners and to chart areas for future research.

This lack of understanding leads to a second conundrum: whether and when IT assimilation translates into business value. Although scholars generally agree that management support is positively related to assimilation, the relationship between assimilation and business value is more tenuous. Some studies suggest that IT assimilation is positively associated with business value. For example, enterprise architecture assimilation can help a firm sense and respond to environmental change (Hazen et al., 2017). Other studies suggest the opposite. Vertical information systems standards assimilation is negatively related to organizational productivity and clerical efficiency (Xu et al., 2014). There are also conflicting findings for the same IT innovation. Consider electronic data interchange (EDI). Empirical evidence shows that EDI assimilation can both help (Kurokawa et al., 2008) and hurt (Nakayama, 2003) relations with suppliers. Finally, some researchers have found that IT assimilation has no significant effect on business value (Droge & Germain, 2000; Setia et al., 2011; Subramani, 2004).

There may be several explanations for these mixed findings. IT assimilation can have effects at the process level (Mishra et al., 2007) and the firm level (Ramamurthy et al., 1999). Thus, the value target of assimilation might help us explain the mixed findings. National cultural differences may also play an explanatory role (Sabherwal & Jeyaraj, 2015). Simply put, theoretical and empirical challenges make it difficult to fully understand the link between assimilation and business value. While recent meta-analyses help us understand whether and when IT investments (Sabherwal & Jeyaraj, 2015) and IT capabilities (Mandrella et al., 2020) generate business value, we do not have a solid understanding of the relationship between IT assimilation and the business value of IT.

In summary, despite the breadth and depth of research on top management support, IT assimilation, and the business value of IT, it is challenging to draw meaningful conclusions from this body of work. We do not have a nuanced understanding of when and how top management should support IT assimilation, and our understanding of the link between IT assimilation and the business value of IT is not very clear. We take stock of this literature and consolidate findings in a way that provides substantive recommendations to practitioners and guides future research. Namely, our first objective is to *assess the connections among top management support, IT assimilation, and the business value of IT*. We focus on top management support and the business value of IT because these constructs are frequently studied in connection with IT assimilation. Furthermore, we draw on the structuration theory of technology assimilation and the resource-based view of the firm to conceptualize these relationships.

We use meta-analytic techniques to address this objective; thus, we also include moderators that can help us explain findings in this area. Meta-analysis allows us to control for methodological factors such as sampling error and measurement error. While these errors are potential explanations for inconsistent findings in any research domain (Hunter & Schmidt, 2004), we include

a set of four theory-based moderators salient to our study. First, we leverage the IT champion literature to conceptualize *support manifestation*—whether top management explicitly or implicitly supports the IT innovation. Second, we rely on resource-based theory to identify the *value target*—whether business value is targeted at the process level or the firm level. Third, we draw on Swanson's (1994) IT innovation typology to theorize the *innovation scope*— whether the innovation is at the enterprise or function level. Finally, we use Hofstede's (1980, 2001) work on national culture to formulate our fourth moderator, *power distance*—the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. We selected these moderators for theoretical reasons and because they characterize (in part) the IT assimilation literature. We also included two methodological moderators—*measurement type* (objective versus perceptual data) and *respondent type* (single versus multiple respondents) (Gerow et al., 2014; Sabherwal & Jeyaraj, 2015). Hence, our second objective is to *identify and assess moderators that affect our relationships of interest*. This allows us to explain variation between studies (Hunter & Schmidt, 2004), test new relationships (Eden, 2002), and gain a better overall understanding of the intersection of top management support, IT assimilation, and the business value of IT.

2 Theoretical Background and Research Model

2.1 Primary Constructs and Relationships

2.1.1 IT Assimilation

Figure 1 depicts our research model. We start with IT assimilation, a construct that has been viewed as the extent to which an organization uses web-based technologies for different e-commerce activities (Chatterjee et al., 2002), the degree to which e-procurement innovations have diffused across an organization's procurement process (Rai et al., 2009), and the extent to which electronic supply chain management is used to facilitate information sharing and ordering/fulfillment management (Wu & Chuang, 2010). Despite this diversity, we can identify a few enduring characteristics of the IT assimilation construct. First, assimilation involves an IT innovation. This implies a second point: assimilation is an organizational phenomenon. It can be viewed from the vantage point of various collective entities, including but not limited to the project level (Barczak et al., 2008), the organizational subunit level (Cooper & Molla, 2014), and the entire organization (Premkumar & Ramamurthy, 1995). Third, assimilation occurs after an organization has adopted a specific IT innovation (Fichman & Kemerer, 1997). It is only after adoption that an IT innovation can be "absorbed into the worklife of the firm" (Swanson & Ramiller, 2004, p.558). Finally, assimilation involves some level of use, diffusion and/or routinization across organizational work activities (Klein, 2012; Ranganathan et al., 2004). With these characteristics in mind, we define IT assimilation as the degree to which the use of technology diffuses across organizational processes and becomes routinized in the activities of those processes (Liang et al., 2007; Purvis et al., 2001; Roberts et al., 2017).

2.1.2 Top Management Support

The structuration theory of technology assimilation helps us link top management support to IT assimilation. Scholars have used this theory to explain the assimilation of computer-aided software engineering technologies (Purvis et al., 2001), electronic procurement innovations (Rai et al., 2009), and web technologies (Chatterjee et al., 2002). The theory focuses on the relationship between social structure and human actions and it proposes that IT assimilation is a cumulative outcome of individual actions shaped by institutional metastructures (Orlikowski, 1992; Scott, 2001). These metastructures sustain established structures and patterns of action that reproduce behaviors or enable the development of new structures and actions that generate new behaviors (Orlikowski et al., 1995). Along these lines, scholars have identified three metastructures that influence individuals' cognitions and behaviors—signification, legitimization, and domination (Orlikowski, 1992; Scott, 2001). Top management support serves as a metastructure in all three areas (Chatterjee et al., 2002; Rai et al., 2009).

Metastructures for signification furnish meaning and serve as guides for individual actions and behaviors. These metastructures shape the strategic, relational, and technological context in which an IT innovation must be interpreted and assimilated. As an illustration, top management can offer visions and guidelines to organizational members about the opportunities and benefits associated with assimilating an IT innovation (Chen et al., 2015; Rai et al., 2009). Metastructures for legitimization validate behaviors aligned with the organization's goals and values. These metastructures regulate actions and behaviors for IT assimilation such that they are consistent with organizational goals. For example, when top managers believe that a technology is critical to organizational success, their support serves as a powerful signal to the organization about the importance of assimilating the technology to the fullest extent possible (Chatterjee et al., 2002; Liang et al., 2007).

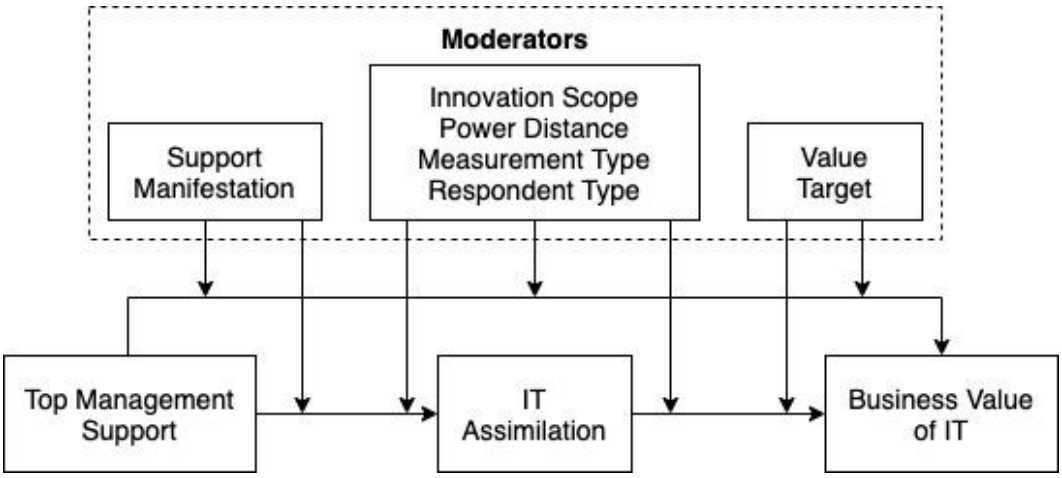

Figure 1. Research Model

Finally, metastructures for domination enforce institutional rules to direct individual actions and behaviors. These metastructures are enabled by political support and financial resources for IT assimilation. To illustrate, top management can support an IT innovation through expressed mandates, reward systems, and political actions that show their commitment to the technology (Premkumar & Ramamurthy, 1995; Purvis et al., 2001). Without powerful, continuous support from top management throughout the assimilation life cycle, it becomes difficult for organizational members to determine how the technology is relevant to the organization's mission and goals, allocate resources that bolster assimilation efforts, and modify routines to use the technology in everyday work.

2.1.3 The Business Value of IT

The business value of IT is defined as "the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts" (Melville et al., 2004, p. 287). The resource-based view of the firm helps us explain the relationship between IT assimilation and the business value of IT.[3] Resource-based theory conceptualizes a firm as a set of resources that, taken together, establishes a firm's competitive position (Barney, 1991; Wernerfelt, 1984). The theory proposes that firms that possess valuable, rare, and unique resources will enjoy performance advantages; furthermore, these advantages can be sustainable if one or more resources is difficult for other firms to imitate (Barney, 1991; Bharadwaj, 2000).

Using this theoretical lens, we can conceptualize IT assimilation as an organizational resource that can have multiple performance impacts. First, automation-based improvements result in cost reduction and operational benefits (Mishra et al., 2007). Informational advantages emerge from IT's ability to process information and expand an organization's ability to collaborate (Malhotra et al., 2007) and compete (Subramani, 2004). Finally, transformational effects result in operational and strategic benefits when organizational work activities are modified during the assimilation process (Ramamurthy et al., 1999; Sanders, 2008). These studies suggest that firms can generate business value when the use of technology diffuses across organizational processes and becomes routinized in the activities of those processes.

Despite these results, assimilation may have adverse effects. For example, Hill et al. (2009) demonstrated that EDI assimilation may hurt a firm's competitiveness in the food industry. Similarly, in their survey of Chinese organizations that implemented RosettaNet, Xu et al. (2014) showed that the assimilation of vertical IS standards may hinder productivity (Xu et al., 2014). Other research has suggested that assimilation does not generate business value. Setia et al.'s (2011) analysis of secondary data in the healthcare industry found that the assimilation of neither business applications nor clinical applications is related to hospital performance in the form of net income per patient day. We now turn to our second objective.

2.2 Moderators

To address our second objective, we identified and assess factors that might affect the relationships

[3] Scholars have used other theories to explain the assimilation-value relationship, e.g., dynamic capabilities (Chen et al., 2015). We use resource-based theory because it is well-established (Crook et al., 2008; Liang et al., 2010) and provides a strong rationale for how and why IT assimilation can create business value.

depicted in Figure 1. We identified four moderators specific to this body of research—support manifestation, value target, innovation scope, and power distance. We also included two methodological moderators—measurement type and respondent type. Considering these variables as moderators allowed us to explain variation between studies (Hunter & Schmidt, 2004) and test previously unassessed relationships (Eden, 2002). Table 1 includes definitions and examples of all moderator variables.

2.2.1 Support Manifestation

We first discuss *support manifestation*, a moderator we define as the way in which top management demonstrates its support for IT assimilation. We leverage the IT champion literature [4] to help us distinguish two types of support manifestation—explicit and implicit. Broadly speaking, a champion is any individual who makes a decisive contribution to an innovation by actively and enthusiastically promoting its progress through critical stages in order to obtain resources and active support from stakeholders (Roure, 1999). In our context, a champion is a manager who explicitly promotes an IT innovation throughout the assimilation stage. In other words, explicit support for IT assimilation is evidenced by clearly demonstrated, champion-oriented behaviors on the part of management (Barczak et al., 2007; Purvis et al., 2001). In contrast, implicit support is implied though not actively expressed. Implicit support for IT assimilation may manifest in top management understanding and appreciating the benefits of a particular IT innovation (Chen et al., 2015; Wang & Zander, 2018). Management might allocate resources to the IT assimilation initiative just as they would any other organizational project; however, they do not actively promote the assimilation initiative.

The champion concept Is based partly on theories of transformational leadership and social influence. Transformational leaders are charismatic and inspiring; they suggest ideas that challenge followers' views of problems and their solutions, and they take a developmental and individualistic orientation toward followers (Bass, 1985). Similarly, champions inspire others with their vision of an innovation, persist in promoting their vision, and gain commitment from others to support the innovation (Howell & Higgins, 1990). Champions are also similar to transformational leaders in that their visions transcend individual interests to create favorable beliefs about the innovation (Dong et al., 2007). In addition to leadership behaviors, champions frequently attempt to influence others with a wide variety of influence tactics (Howell & Higgins, 1990). In fact, Schon (1983, p. 84) argued that champions are "capable of using any and every means of informal sales and pressure in order to succeed." Champions prefer informal persuasion methods (Howell & Boies, 2007), such as explaining and educating others in low-pressure settings (Beath, 1991).

Given their transformational leadership style and ability to influence others, champions are well-equipped to overcome resistance, secure resources, and promote IT innovations (Grover, 1993; Premkumar & Ramamurthy, 1995). However, the findings regarding champions' impact on IT projects are unclear (Renken & Heeks, 2019); furthermore, champions can also be "dangerous" and may expose the company to unacceptably high risk (Gogan et al., 2020). It is also not clear if explicit, champion-based management support is linked to business value. For example, Wu et al. (2003) found that explicit support is positively related to sales performance. However, Barczak et al. (2007) found no support for a relationship between explicit support and market performance. Thus, it is difficult to draw any solid conclusions regarding whether explicit top management support has a different effect on IT assimilation and IT business value than implicit support. With this in mind, support manifestation may moderate the relationships between (1) top management support and assimilation and (2) top management support and the business value of IT.

2.2.2 Value Target

Earlier we used resource-based theory to connect IT assimilation to business value of IT. This same theory helps us conceptualize our next moderator—the *value target*, that is, whether researchers measure business value at the process level or the firm level. Historically, scholars developed resource-based theory to understand the conditions under which firms are able to develop and maintain a competitive advantage (Barney, 1991; Wernerfelt, 1984). Along these lines, subsequent research provided evidence that superior firm-level IT capability is positively associated with superior firm performance (Bharadwaj, 2000). However, there may be circumstances where using resource-based theory to study performance implications at the firm level can lead to misleading conclusions; as such, a process-level analysis may be more appropriate for at least three reasons (Ray et al., 2004).

[4] We build on the IT championship literature given its popularity (Renken & Heeks, 2019) and theoretical foundation (Howell & Higgins, 1990; Schon, 1983).

Table 1. Moderators

Moderator	Definition	Example(s)
Support manifestation		
Explicit	Support is the extent to which top management explicitly promotes the IT innovation throughout the assimilation stage.	Top managers in our business unit keep telling people that they must bring more of their business practices online in order to meet customers' future needs (Wu et al., 2003)
Implicit	Support is the extent to which top management implicitly promotes the IT innovation throughout the assimilation stage.	Senior management of our firm believes that the world wide web has the potential of providing benefits to the firm (Chatterjee et al., 2002).
Value target		
Process	Business value was measured at the process level.	Claims performance (Klein, 2012), procurement performance (Mishra et al., 2007)
Firm	Business value was measured at the firm level.	Firm performance (Liu et al., 2013), productivity (Hill et al., 2009)
Innovation scope		
Enterprise	An IT innovation that applies IS products and services across multiple functions and integrates with core business technology	EDI (Premkumar & Ramamurthy, 1995), ERP (Lai et al., 2016), SCM (Subramani, 2004)
Function	An IT innovation that applies IS products and services to one function and does not integrate with core business technology	Enterprise architecture (Hazen et al., 2017), green IT practices (Cooper & Molla, 2014), vertical IS standards (Xu et al., 2014)
Power distance		
Low	A country that does not emphasize social hierarchy, authority, and distribution of power	Canada (Subramani, 2004), United States (Ramamurthy et al., 2008)
High	A country that emphasizes social hierarchy, authority, and distribution of power	China (Lai et al., 2016), Korea (Lee & Lim, 2003)
Measurement type		
Objective	Data were collected from records/official documents.	Fichman & Melville, 2014; Setia et al., 2011
Perceptual	Data were collected from evaluator perceptions.	Thong, 1999; Wolf et al., 2012
Respondent type		
Single	A single informant responded to the questionnaire.	Barczak et al., 2007; Liu et al., 2013
Multiple	Multiple informants responded to the questionnaire.	Malhotra et al., 2007; Ramamurthy et al., 1999

First, aggregating the outcomes of numerous business processes can make it difficult to determine whether a particular set of resources actually creates competitive advantages for a firm. Second, a firm's stakeholders may appropriate the economic profits that can be engendered by a firm's business processes before those profits are reflected in a firm's overall profitability. Finally, a firm's competitive potential rests largely on the execution of its business processes.

Scholars have followed this line of reasoning to study the performance impacts of IT resources on processes such as customer service (Ray et al., 2005) and new product development (Pavlou & El Sawy, 2006). Likewise, IT assimilation researchers have studied process-level measures such as on-time delivery (Ahmad & Schroeder, 2001), operational coordination (Sanders, 2008), and procurement productivity (Rai et al., 2009). In fact, Mishra et al. (2007) used resource-based theory to connect IT assimilation to the business value of IT at the process level. They found differential effects: Internet assimilation in the procurement search stage is not related to procurement-process performance; however, internet assimilation in the procurement order initiation and completion stage is positively related to procurement-process performance. Yet there are certainly business value of IT measures in the IT assimilation literature at the firm level, such as business growth (Chen et al., 2015), competitive performance (Subramani, 2004), and organizational agility (Hazen et al., 2017). According to resource-based theory, process-level measures may reflect the performance impact of IT assimilation better than firm-level measures. Thus, the value target may moderate the relationships between (1) assimilation and the business value of IT and (2) top management support and the business value of IT.

2.2.3 Innovation Scope

We build on Swanson's (1994) tri-core innovation typology to conceptualize our third moderator, *innovation scope*. According to Swanson, the domain of IT innovation incorporates "both the functional IS core and the business administration and technology cores via IS products and services" (Swanson, 1994, p. 1076). Swanson describes three types of IT innovations. Type 1 innovations include process innovations restricted to the functional information systems (IS) core, Type 2 innovations apply IS products and services to the organization's administrative core, and Type 3 innovations integrate IS products and services with core business technology. An important distinction between Type 2 and Type 3 is that Type 3 innovations directly affect production of the organization's goods and services (i.e., core business technology). Type 2 innovations do not have this same direct effect; rather, they support administrative processes such as human resources, accounting, and payroll. Although this typology serves an analytical purpose, Swanson notes that actual IT innovations need not always conform to these pure types. For example, some applications may be used at the departmental, interdepartmental, enterprise, or interorganizational levels (Winkler & Brown, 2013). We leverage Swanson's typology because it has been extensively used in IT innovation research (Grover, 1997; Grover et al., 1997; Jeyaraj et al., 2006; Lyytinen & Rose, 2003; Roberts et al., 2017).

In our setting, enterprise innovations that integrate IT into core business technology (Swanson's Type 3) may require more organizational change and resources than innovations that do not span the enterprise (Swanson's Type 1 and Type 2). Moreover, IT innovations that affect multiple organizational units may require more top management support and have a greater impact than innovations that affect a single unit (Jarvenpaa & Ives, 1991). Top management support may also be necessary to drive organizational change efforts and allocate resources in the case of enterprise innovations (Dezdar & Ainin, 2011; Markus & Tanis, 2000). Liang et al.'s (2007) study of ERP assimilation is a nice example. Top management support lends legitimacy to an ERP system, and this legitimacy "is especially important since ERP systems are high impact systems that could encounter strong resistance from organizational elements" (Liang et al., 2007, p. 64). Liang et al. provide evidence that management support is positively related to ERP assimilation. Innovations that integrate IT into the business core may also generate more business value than innovations that only apply IT to a single function (e.g., administrative processes or the IT unit) (Karimi et al., 2007a). Thus, we conceptualize the innovation scope as the enterprise or function level. In line with Swanson's work, enterprise innovations integrate IS products and services with core business technology and usually span multiple functions across the enterprise. Function innovations are IT innovations centered on one function; they do not integrate IS products and services with the core business technology. We include innovation scope as a moderator for all three relationships in our research model.

2.2.4 Power Distance

We posit that power distance—one dimension of national culture—plays an important role in our study. Generally speaking, culture is the homogeneity of characteristics that separates one people group (i.e., society) from another (Tihanyi et al., 2005). Over time, culture becomes ingrained through social norms, organizational structures, and standard operating procedures. In doing so, culture describes a society's profile with respect to norms, values, and institutions (Hofstede, 1980). At the national level, culture reflects an aggregate of the typical individually valued priorities in a society (Tihanyi et al., 2005). Prior research has identified the effects of specific dimensions of national culture on innovation (Nakata & Sivakuma, 1996; Saldanha et al., 2021; Taylor & Wilson, 2012).

Power distance refers to the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally (Hofstede, 1980). In high power distance cultures, subordinates expect to be told what to do; in low power distance cultures, subordinates expect to be consulted (Hofstede, 2001). By extension, organizational members working in high power distance cultures may be more likely to follow top management directives to assimilate an IT innovation into their processes and routines than people working in low power distance cultures (Lai et al., 2016). Put another way, top management support may have a stronger effect on IT assimilation in high power distance cultures (versus low power distance).

We can extend this line of thinking to conceptualize the effects of management support and assimilation on the business value of IT. Subordinates in high power distance cultures expect their supervisors to tell them what to do; thus, if management tells organizational members to assimilate a particular IT innovation into their processes and routines, they will most likely do so (Peterson et al., 1995) and increase the likelihood that the organization will reap business value from IT assimilation. In contrast, subordinates in low power distance cultures do not necessarily expect their supervisors to simply give orders; in fact, they often expect to be consulted. As a result, organizational members may be more likely to resist IT innovation (Lapointe & Rivard, 2005), thereby preventing or at least reducing the organization's ability to extract business value from IT assimilation initiatives. With this in mind, we include power distance as a moderator for all three relationships in our research model.

2.2.5 Measurement/Respondent Type

Methodological moderators may explain variation between studies because they can illuminate inconsistencies in our relationships of interest (Hunter & Schmidt, 2004). We address two commonly referenced methodological issues that may foster conflicting results and thus confusion in the assimilation literature—*measurement* and *respondent* (Gerow et al., 2014; Mandrella et al., 2020; Sharma et al., 2009). We distinguish two types of measurement—objective and perceptual. Objective measures tend to be more reliable yet can be difficult to obtain; perceptual measures are typically better suited to the study context and variables of interest but can introduce certain biases (Sabherwal & Jeyaraj, 2015). Likewise, we analyze data from two types of respondents—data collected from a single informant or data collected from multiple informants. Using single respondents may lead to common method bias (Podsakoff et al., 2003); however, collecting data from multiple sources is difficult and may lead to subjectivity and measurement error (Tallon, 2007). We include measurement type and respondent type as moderators for all three relationships in our research model.

3 Research Method

We used meta-analysis to mathematically cumulate the results of studies on top management support, IT assimilation, and the business value of IT. Meta-analysis is a statistical technique that systematically combines results from empirical studies that address similar research questions (Hunter & Schmidt, 2004). We undertook the following steps: we (1) identified studies that examine one or more relationships in our theoretical model (Figure 1), (2) coded results reported by those studies, and (3) conducted analyses to assess the nature and strength of the relationships in our model.

3.1 Identifying Studies

We collected studies to be included in our meta-analysis from multiple sources, primarily using a keyword search on several electronic databases such as *Business Source Complete* and *Science Direct* for articles published in journals, the *AIS eLibrary* for conference proceedings, and *Google Scholar* for doctoral dissertations. Keywords for the search included "information systems" or "information technology" coupled with "assimilation," "routinization," "infusion," "management support," or "performance." We also identified studies by examining the bibliographies of the studies we collected through the search using keywords.

We established three criteria for the inclusion of studies in our analysis. First, the study had to include at least two of the three constructs in our research model (i.e., top management support, IT assimilation, business value of IT). We excluded studies that examined only one of these constructs. Second, the study had to use a collective entity, such as an organization or business unit, as the unit of analysis. We did not include studies that dealt with an individual level of analysis (e.g., Goo et al., 2015; Lee et al., 2016). Finally, the study needed to be quantitative in nature. We contacted authors of those studies with missing correlations to request that information with the goal of including as many studies as possible in the meta-analysis. We also requested unpublished studies from IT assimilation researchers.

To prevent unfair weighting, each study must provide an independent data set (Hunter & Schmidt, 2004); thus, we completed additional screenings. First, if two studies showed results for the same set of organizations, then only one of the studies was included in the sample. One study showed two sets of results (Barczak et al., 2008), the first for organizations in the United States and the second for organizations in the Netherlands. We only coded the results for the Netherlands since the results for the United States were similar to Barczak et al. (2007), a study also included in the sample. We excluded studies such as Karimi et al. (2007b), Ramamurthy and Premkumar (1995), and Saraf et al. (2013) since they used the same data sets as other studies in the sample—namely Karimi et al. (2007a), Ramamurthy et al. (1999), and Liang et al. (2007), respectively.

Second, if the study reported results for multiple groups of respondents, then we coded the study as contributing multiple observations. For example, Wolf et al. (2012) presented two sets of results, one for organizations in a low mindfulness category and another for those in a high mindfulness category, and Nakayama (2003) reported results for two types of organizations: suppliers and retailers. These studies contributed two observations each to the meta-analysis sample. Our sample comprised 78 studies, including six conference proceedings and two dissertations to address the file-drawer problem (Rosenthal, 1979), and contained 80 "study-level" observations. Appendix A presents a complete list of included studies. Table 2 provides further detail regarding the number of studies included/excluded.

3.2 Coding Studies

Two of the authors coded all studies in the meta-analysis sample. We undertook two levels of measurement. At the study level, we captured the innovation, country in which the study was set, measurement type, and respondent type. We used the innovation to cluster the observations into enterprise and function innovations. We used the countries to code power distance based on Hofstede's national "power distance" cultural dimension.[5] We coded the BVIT measurement type as either objective (e.g., Compustat data) or perceptual (e.g., survey data), and coded each respondent type as single respondent or multiple respondents.

[5] https://www.hofstede-insights.com/country-comparison/

Table 2. Studies Included/Excluded

Category	Count
Number of studies identified	208
Number of studies excluded	
Theoretical papers, qualitative research	7
Non-organizational unit of analysis	4
At least 2 of the 3 constructs unavailable	16
Assimilation different from conceptualization	52
TMS different from conceptualization	21
BVIT different from conceptualization	3
Correlations not reported/available	24
Same data set as another study	3
Total	130
Number of studies included in analysis*	78

Note: *Two studies contributed two observations; thus, our sample includes 80 "study-level" observations.

Some IT innovations have important nuances that should be considered when coding them as enterprise or function. Consider green IT and green IS. Green IT practices attempt to minimize the harmful effects of IT operations on the environment through the sourcing, operations, and end-of-life management of IT in an environmentally friendly way (Murugesan, 2008). Scholars usually conceptualize green IT as a function innovation existing at the IT unit level. For example, Cooper and Molla (2014) measured green IT assimilation as the extent to which an IT department has well-developed green IT governance mechanisms, policy frameworks, and practices (among other measures). In contrast, Green IS refers to "IS-enabled organizational practices and processes that improve environmental and economic performance" (Melville, 2010, p. 2). The Green IS concept integrates Green IS products and services with core business technology; hence, scholars typically view Green IS as an enterprise innovation. For example, Loeser et al. (2017) measured Green IS practices as the extent to which an organization uses Green IS to develop environmentally friendly business processes, control the effectiveness of environmental programs, and transform the company toward long-term sustainability.

With this in mind, we paid special attention to the way in which researchers conceptualized IT innovations and defined IT assimilation when coding a study as either enterprise or function innovation. As an illustration, Ramamurthy et al. (1999) define EDI assimilation as the extent to which EDI interfaces with and is diffused across other IS applications and organizational work processes. This suggests that EDI is integrated with core business technology; hence, we coded it as an enterprise innovation. Chen et al. (2015) define big data analytics assimilation as using advanced technologies to examine big data in order to uncover useful information to help make better decisions. In this context, analytics is applied to an aspect of the organization's administrative core (decision-making); thus, we coded it as a function innovation.

At the relationship level, we coded the zero-order Pearson correlation, construct reliabilities,[6] sample size, support manifestation, and the value target. We considered top management support manifestation to be explicit or implicit. Barczak et al.'s (2007) "existence of champion" construct illustrates explicit support. They measured this construct as the extent to which one project team member was committed to encouraging and training others to use particular IT tools. The notion of commitment implies explicit, active support. In contrast, Liang et al.'s (2007) "top management beliefs" construct depicts implicit support. They measured this construct as the extent to which senior management believes that ERP has the potential to provide significant business benefits to the firm and a competitive arena for firms. The term "potential" suggests implicit, passive support. We coded the value target as either being at the process level or the firm level. For example, constructs such as claims management performance (Klein, 2012) and business process outcomes (Karimi et al., 2007a) are process-level outcomes; constructs such as firm performance (Shao et al., 2016) and competitive performance (Subramani, 2004) are firm-level outcomes. We did not encounter any studies that measured the business value of IT at something other than the process or firm level. Table 3 provides descriptive statistics regarding the studies we collected and analyzed. Appendices B and C provide further detail on how we coded the studies.

[6] If a study included both the alpha and the internal consistency reliability, we coded the alpha.

Table 3. Descriptive Statistics

Moderator	Category	Number of studies	Percentage of studies
Support manifestation	Explicit	8	17%
	Implicit	39	83%
Value target	Process	20	34%
	Firm	39	66%
Innovation scope	Enterprise	42	54%
	Function	36	46%
Power distance	Low	43	58%
	High	31	42%
Measurement type	Objective	3	4%
	Perceptual	75	96%
Respondent type	Single	69	88%
	Multiple	9	12%

The interrater agreements (Cohen's kappa) for all coded variables were higher than the recommended minimum threshold of 0.70 (Krippendorff, 2004; Landis & Koch, 1977). If a study employed multiple variables for the same construct, we computed the composite of the correlations involving the variables and the reliabilities. For instance, Chatterjee et al. (2002) examined the effect of top management beliefs and participation on web assimilation. We computed the composite of the two correlations using: $r_{xy} = \frac{\sum r_{xy_i}}{\sqrt{n+n(n-1)\bar{r}_{y_i y_j}}}$ and the composite reliability using: $r_{xx} = 1 - \frac{\left(\sum w_j^2 s_j^2\right) - \left(\sum w_j^2 s_j^2 r_{jj}\right)}{\left(\sum w_j^2 s_j^2\right) + 2\left(\sum w_j w_k s_j s_k r_{jk}\right)}$ where n = sample size, r = correlation, w = weight of variable, and s = standard deviation (Hunter & Schmidt, 2004; Mosier, 1943). These refinements resulted in 44 correlations for the relationship between top management support and assimilation, 57 correlations between assimilation and the business value of IT, and 31 correlations between top management support and the business value of IT.

3.3 Analyzing Studies

We computed the population correlation estimates using the Schmidt-Le meta-analysis program (Schmidt & Le, 2005). This program uses the Hunter and Schmidt (2004) random-effects modeling approach to meta-analysis. The program corrects for sampling and measurement errors in addition to calculating credibility intervals and variances. To account for sampling error, the program weighs each observed correlation from a primary study by its sample size. To account for measurement errors and prevent a downward bias of the population correlation point estimates (i.e., estimates that are too small), the program uses an artifact distribution from the database of reliabilities we coded. We used this technique because reliabilities were not available for all primary studies; this allowed us to correct artifacts at the meta-analysis level even though we could not correct individual correlations (Hunter & Schmidt, 2004). For the moderator analyses, we first partitioned the data into individual groups based on the moderators described earlier. We also used the Schmidt-Le program (Schmidt & Le, 2005) to conduct these analyses. We followed recommended guidelines (Hwang & Schmidt, 2011) to create and assess credibility intervals in our moderator analyses.

4 Results

4.1 Main Effects

Table 4 shows results for the main effects (our first objective). The credibility interval columns (i.e., 80% CRI with 10% and 90% CV subcolumns) report the range of correlations that are possible based on the studies included in the meta-analysis. Wider ranges in the credibility intervals indicate that the estimated mean rho is less reliable; overlapping credibility intervals indicate the estimated mean rho values may not be statistically different (Gerow et al., 2014). While the estimated mean rho for the top management support and assimilation relationship is 0.52, the credibility intervals indicate this estimate could be as low as 0.28 or as high as 0.75. Similarly, the estimated mean rho values for the assimilation-business value and top management support-business value relationships are 0.31 and 0.45; the credibility intervals indicate that these estimates could be as low as 0.01 and 0.14 or as high as 0.61 and 0.76, respectively. Furthermore, the percentages of variance in observed correlations attributable to sampling and measurement errors in Table 4 (i.e., PVA) are 24%, 12%, and 20% for top management support-assimilation, assimilation-business value, and top management support-business value relationships, respectively. A moderator analysis could help narrow these ranges and provide an explanation for the high and low corrected population correlation estimates.[7]

[7] We conducted a post hoc analysis to determine whether IT assimilation mediates the relationship between top management support and the business value of IT. Results are available in Appendix D.

Table 4. Results: Main Effects

Relationship	$\hat{\rho}$	*k*	*N*	Var.	SD_r	80% CRI		PVA	FN
						10%	90%		
TMS → ASSIM	0.5151	44	8492	0.0349	0.1868	0.2760	0.7541	24%	157
ASSIM → BVIT	0.3105	57	39180	0.0558	0.2363	0.0080	0.6129	12%	145
TMS → BVIT	0.4472	31	5195	0.0589	0.2427	0.1366	0.7578	20%	100

Note: TMS = top management support; ASSIM = IT assimilation; BVIT = business value of IT; $\hat{\rho}$ = corrected population correlation estimate; *k* = number of studies with a correlation; *N* = number of observations across the primary studies; Var. = variance of true score correlation; SD_r = standard deviation of corrected population correlation estimate; CRI = credibility interval around corrected population correlation estimate; PVA = percent of variance in observed correlations attributable to sampling and measurement errors; FN = fail-safe *N*

4.2 Moderator Results

We organize the results of our moderator analyses by relationship. That is, we first discuss moderators that play a role in the relationship between top management support and assimilation. We do the same for the following two relationships in our research model. We then conclude with a concise summary of important moderators in this body of literature.

We performed two-sample *t*-tests to determine whether estimated mean rhos are significantly different for each moderator subgroup. Table 5 depicts the results of our moderator analyses for the relationship between top management support and assimilation. The estimated mean rhos for explicit (0.51) and implicit (0.49) support manifestation are not significantly different (t = 0.77, n.s.). Similarly, the estimated mean rhos for enterprise (0.53) and function (0.50) studies are not significantly different (t = 0.49, n.s.). This suggests that support manifestation and innovation scope do not help us explain variance in the relationship between top management support and IT assimilation.[8]

Studies conducted in low power distance countries have an estimated mean rho of 0.49, and studies conducted in high power distance countries have an estimated mean rho of 0.63. Although the credibility intervals of these subgroups overlap, the estimated mean rhos are significantly different (t = -2.34, p < 0.05). Finally, the estimated mean rhos for single respondent (0.51) and multiple respondent (0.44) studies are not significantly different.

Table 6 shows the results of our moderator analyses for the relationship between assimilation and the business value of IT. Studies that target the business value of IT at the process level have an estimated mean rho of 0.69, and studies that target the business value of IT at the firm level have an estimated mean rho of 0.27. The credibility intervals of these subgroups overlap; however, the estimated mean rhos are significantly different (t = 7.27, p < 0.01). Likewise, the estimated mean rhos for enterprise (0.61) and function (0.24) studies are significantly different (t = 5.95, p < 0.01).

For power distance, studies conducted in low power distance countries have a lower estimated mean rho (0.28) than studies conducted in high power distance countries (0.65). These estimated mean rhos are significantly different (t = -4.69, p < 0.01). Finally, studies that used objective data have a significantly lower estimated mean rho (0.18) than studies that used perceptual data (0.62); similarly, studies that collected data from a single respondent have a significantly lower estimated mean rho (0.30) than studies that collected data from multiple respondents (0.75). However, we interpret these methodological moderator results with caution due to their low *k*-values (two and three) and low fail-safe *N* values (six and ten). Our results suggest that the value target, innovation scope, and power distance help explain the variance in the relationship between IT assimilation and the business value of IT.

Table 7 depicts the results of our moderator analyses for the relationship between top management support and the business value of IT. The estimated mean rhos for explicit (0.29) and implicit (0.50) support manifestation are significantly different (t = -2.06, p < 0.05). Furthermore, the credibility interval for the "explicit" subgroup contains zero, suggesting that the correlation may be positive, negative, or zero. We found no significant differences in the estimated mean rhos for the other moderator subgroups (value target, innovation scope, power distance, and respondent type). Table 8 summarizes the results of all moderator analyses.

[8] According to Switzer et al. (1992), *k*-values less than 10 should be interpreted with caution. However, low k-values are typical for organizational-level meta-analysis studies (Lee & Xia, 2006; Mandrella et al., 2020; Roberts et al., 2017; VanderWerf & Mahon, 1997).

Table 5. Moderator Results: Top Management Support → IT Assimilation

	$\hat{\rho}$	*k*	*N*	Var.	SD_r	80% CRI		PVA	FN
						10%	90%		
Support manifestation (*t* = 0.77, n.s.)									
Explicit	0.5104	8	1360	0.05	0.22	0.2323	0.7885	16%	28
Implicit	0.4872	36	6886	0.04	0.20	0.2313	0.7431	16%	124
Innovation scope (*t* = 0.49, n.s.)									
Enterprise	0.5252	26	4980	0.02	0.14	0.3435	0.7068	39%	94
Function	0.4974	18	3512	0.05	0.23	0.1999	0.7948	12%	63
Power distance (*t* = -2.34, p < 0.05)									
Low	0.4849	29	5102	0.04	0.21	0.2217	0.7481	22%	99
High	0.6320	12	2314	0.01	0.08	0.5291	0.7348	57%	50
Respondent type (*t* = 0.68, n.s.)									
Single	0.5118	40	8026	0.03	0.18	0.2786	0.7450	20%	142
Multiple	0.4430	4	466	0.05	0.23	0.1459	0.7401	40%	13

Note: $\hat{\rho}$= corrected population correlation estimate; *k* = number of studies with a correlation; *N* = number of observations across the primary studies; Var. = variance of true score correlation; SD_r = standard deviation of corrected population correlation estimate; CRI = credibility interval around corrected population correlation estimate; PVA = percent of variance in observed correlations attributable to sampling and measurement errors; FN = fail-safe *N*. This table does not include the "measurement type" moderator because all the data collected to assess the relationship between top management support and IT assimilation used perceptual data.

Table 6. Moderator Results: IT Assimilation → Business Value of IT

	$\hat{\rho}$	*k*	*N*	Var.	SD_r	80% CRI		PVA	FN
						10%	90%		
Value target (*t* = 7.27, *p* < 0.01)									
Process	0.6946	19	3567	0.04	0.20	0.4417	0.9475	41%	85
Firm	0.2719	38	35613	0.04	0.21	0.0052	0.5385	12%	90
Innovation scope (*t* = 5.95, p < 0.01)									
Enterprise	0.6106	30	6685	0.07	0.27	0.2658	0.9554	28%	122
Function	0.2446	27	32495	0.03	0.18	0.0181	0.4711	11%	60
Power distance (*t* = -4.69, *p* < 0.01)									
Low	0.2796	40	34342	0.04	0.20	0.0198	0.5394	14%	96
High	0.6547	15	2614	0.16	0.39	0.1500	1.1593	13%	64
Measurement type (*t* = -3.04, *p* < 0.01)									
Objective	0.1819	3	27698	0.00	0.03	0.1494	0.2144	57%	6
Perceptual	0.6158	54	11482	0.06	0.24	0.3026	0.9291	30%	220
Respondent type (*t* = -2.69, *p* < 0.01)									
Single	0.3046	55	39037	0.05	0.23	0.0047	0.6044	11%	139
Multiple	0.7527	2	143	0.00	0.00	0.7527	0.7527	100%	10

Note: $\hat{\rho}$ = corrected population correlation estimate; *k* = number of studies with a correlation; *N* = number of observations across the primary studies; Var. = variance of true score correlation; SD_r = standard deviation of corrected population correlation estimate; CRI = credibility interval around corrected population correlation estimate; PVA = percent of variance in observed correlations attributable to sampling and measurement errors; FN = fail-safe *N*

Table 7. Moderator Results: Top Management Support → Business Value of IT

	$\hat{\rho}$	*k*	*N*	Var.	SD_r	80% CRI		PVA	FN
						10%	90%		
Support manifestation (t = -2.06, p < 0.05)									
Explicit	0.2927	6	1281	0.11	0.34	-0.1401	0.7254	10%	15
Implicit	0.4960	25	3914	0.03	0.18	0.2650	0.7271	31%	87
Value target (t = -1.87, n.s.)									
Process	0.3205	9	1473	0.01	0.12	0.1714	0.4695	42%	23
Firm	0.4977	22	3722	0.07	0.27	0.1541	0.8414	19%	77
Innovation scope (t = 0.78, n.s.)									
Enterprise	0.4814	17	2601	0.09	0.29	0.1076	0.8559	20%	58
Function	0.4102	14	2594	0.04	0.19	0.1632	0.6572	17%	43
Power distance (t = -1.16, n.s.)									
Low	0.4171	24	3837	0.04	0.19	0.1770	0.6572	28%	74
High	0.5338	7	1358	0.12	0.35	0.0823	0.9853	12%	26

Respondent type (t = 0.75, n.s.)									
Single	0.4493	30	5112	0.06	0.24	0.1387	0.7598	20%	97
Multiple	0.2630	1	83	0.00	0.00	0.2630	0.2630	100%	2

Note: $\hat{\rho}$ = corrected population correlation estimate; k = number of studies with a correlation; N = number of observations across the primary studies; Var. = variance of true score correlation; SD_r = standard deviation of corrected population correlation estimate; CRI = credibility interval around corrected population correlation estimate; PVA = percent of variance in observed correlations attributable to sampling and measurement errors; FN = fail-safe N. This table does not include the "measurement type" moderator because all the data collected to assess the relationship between top management support and the business value of IT used perceptual data.

Table 8. Summary of Moderator Results

Moderator	**TMS → ASSIM**	**ASSIM → BVIT**	**TMS → BVIT**
Support manifestation	No difference between explicit and implicit support	N/A	Higher estimate for implicit compared to explicit, but unsure of direction or significance of relationship for explicit support
Value target	N/A	Higher estimate in process value target compared to firm value target	No difference between process and firm value target
Innovation scope	No difference between enterprise and function innovations	Higher estimate in enterprise innovations compared to function innovations	No difference between enterprise and function innovations
Power distance	Higher estimate in high power distance cultures compared to low power distance cultures	Higher estimate in high power distance cultures compared to low power distance cultures	No difference between high and low power distance cultures
Measurement type	N/A	Higher estimate in survey data compared to objective measures	N/A
Respondent type	No difference between single and multiple respondents	Higher estimate in multiple compared to single respondents	No difference between single and multiple respondents

5 Discussion

Our objective was twofold: (1) assess the connections among top management support, IT assimilation, and the business value of IT, and (2) identify and assess moderators that affect those connections. We collected and analyzed 80 empirical studies in this research domain. We now discuss our findings and their implications for research and practice.

5.1 Implications for Research

Our first finding is that *top management support is positively related to both IT assimilation and the business value of IT, and assimilation is positively related to business value.* This finding is consistent with a line of research showing that top management support facilitates the assimilation of IT in organizational processes and routines. It also implies that management support serves as a metastructure that influences organizational members' cognitions and behaviors (Chatterjee et al., 2002; Rai et al., 2009), thereby lending support for the structuration theory of technology assimilation (Orlikowski, 1992; Scott, 2001). We also provide a clearer picture of the mixed findings surrounding assimilation and business value. Studies show nonsignificant (Droge & Germain, 2000; Nakayama, 2003; Setia et al., 2011; Subramani, 2004) and sometimes negative effects (Gunasekaran et al., 2017; Xu et al., 2014) of assimilation on value. Yet when we account for sampling error and measurement error, our findings suggest a positive assimilation-value correlation estimate. This result has implications for IT business value research. In addition to IT investments (Sabherwal & Jeyaraj, 2015) and IT capabilities (Mandrella et al., 2020), the extent to which the use of IT diffuses across organizational processes and becomes routinized in the activities of those processes can generate business value in and of itself. At a broader level, our study also helps us better understand the performance impacts of IT innovation (Fichman, 2004).

We also found that *explicit, champion-oriented support has no unique effect on IT assimilation and may not be related to business value at all.* Researchers have long studied champions in the IS field; however, our understanding of champions' impact on IS-related initiatives such as assimilation is deficient (Renken & Heeks, 2019). Our results suggest that explicit

management support does not exert a greater effect on IT assimilation than implicit support. Future empirical research should investigate explicit top management support for IT assimilation initiatives to give us a more definitive understanding of where, when, and how this type of support makes a difference. Furthermore, implicit support is related to the business value of IT; thus, some form of support for assimilation does result in business value. However, the relationship between explicit top management support and the business value of IT may be positive, negative, or nonexistent. This presents several research opportunities. Does explicit management support for IT assimilation actually translate into business value? If not, could explicit support be combined with other factors (e.g., use of consultants, end user training) in a way that leads to business value? When might champions promote the assimilation of IT innovations that are not in the organization's best interest? We encourage researchers to investigate the nexus surrounding explicit top management support, IT assimilation, and the business value of IT.

Our third finding is that *the value target makes a difference in the assimilation-value relationship*. Consistent with resource-based theory (Ray et al., 2004) and the broader IT value literature (Kohli & Grover, 2008; Melville et al., 2004), process-level measures better reflect the performance impacts of IT assimilation than measures at the firm level. The level of analysis regarding the business value of IT represents an important factor in IT assimilation literature. Different levels of analysis may lead to the over- or underestimation of results; thus, we encourage scholars to pay attention to value-related consequences of assimilation. Future longitudinal research can also try to better understand the causal dependency between the process-level business value of IT and the organizational-level business value of IT in an IT assimilation context.[9]

Fourth, we found that the *innovation scope has no effect on the link between top management support and IT assimilation, yet the assimilation of enterprise innovations generates greater business value than the assimilation of function innovations*. The fact that top management support has similar effects across innovations is surprising, given the emphasis on top management's role in enterprise-wide IT initiatives (e.g., ERP) (Dezdar & Ainin, 2011; Law & Ngai, 2007; Liang et al., 2007). That being said, the vast majority of studies in our sample looked at only one IT innovation. Future research could compare top management support across multiple IT innovations in a single setting. Case studies could also take a closer look to see if there are nuanced differences in how top management supports the assimilation of enterprise versus function IT innovations. The latter result is consistent with claims that enterprise-wide innovations exert a greater impact (and more value) than function innovations (Gattiker & Goodhue, 2005; Markus & Tanis, 2000; Swanson, 1994). Yet this result is intriguing when juxtaposed with our finding that process-level measures reflect BVIT better than firm-level measures.[10] We would expect BVIT from enterprise-wide innovations to surface at the firm level and BVIT from function-level innovations to surface at the process level. Our data did not allow us to explore this issue; however, future research should investigate the intersection of IT assimilation, the innovation scope, and the value target.

Our fifth finding is that *macrolevel cultural factors play a critical role when it comes to top management support, IT assimilation, and the business value of IT*. Management support has a stronger effect in high power distance cultures that stress social hierarchy, authority, and the distribution of power (relative to lower power distance cultures). Organizational members are more likely to submit to management directives to use an IT innovation in high power distance cultures. Thus, management support for IT assimilation carries greater weight in cultures that emphasize hierarchy and authority. Furthermore, if management directs organizational members to assimilate an IT innovation into their business processes, they will most likely try to appease top management and create business value from their efforts. This is consistent with our finding that organizations gain greater business value from IT assimilation in high power distance cultures. However, power distance does not appear to influence the relationship between management support and business value.[11] These macrolevel findings raise several questions. How does management support look in high versus low power distance organizations? Does management support lead to different levels of business value when assimilating IT innovations? Are there alternative ways in which management can encourage IT assimilation in organizations that do not emphasize hierarchy and authority? Do other macrolevel factors[12] come into play? Succinctly put, our findings suggest that future IT assimilation research should incorporate a macrolevel perspective.

[9] We thank an anonymous reviewer for helping us identify this suggestion.

[10] We thank an anonymous reviewer for pointing this out.

[11] That being said, assimilation does partially mediate the relationship between top management support and business value of IT (see Appendix D). Thus, our results show an incomplete understanding of power distance's role in IT assimilation.

[12] As an illustration, we initially included "economic region" as a macrolevel moderator in an earlier version of this paper. Unfortunately, we had to drop this moderator because it is highly correlated with power distance. Thus, although power distance is theoretically relevant to our study context, economic region—or other macrofactors—may also explain variation in the relationships in our research model. We thank an anonymous reviewer for identifying and helping us sort through this issue.

Finally, we found that the population correlation estimate between assimilation and business value might be lower for (1) studies that use objective measures (versus studies that use perceptual measures) and (2) studies that use single respondents (versus studies that use multiple respondents). However, we are not very confident in this finding given the low *k*-values for objective measure studies ($k = 3$) and multiple respondent studies ($k = 2$). The fail-safe values are also quite low (6 and 10, respectively). We note *a lack of studies with objective measures (4% of our collected studies) and a lack of studies with multiple respondents (12% of our collected studies).* Future research should thoughtfully use objective measures and collect data from multiple respondents whenever possible (i.e., use more rigorous research designs). Doing so could help us gain a more accurate understanding of the relationships surrounding top management support, IT assimilation, and the business value of IT.

5.2 Implications for Practice

Our findings have several implications for practice. First, top management support facilitates the assimilation of IT innovations; however, management should recognize that explicitly championing an IT innovation may not necessarily be more beneficial than implicit forms of support (e.g., articulating a vision for the innovation, allocating resources for the assimilation initiative) for assimilation. Furthermore, it is not clear if explicit support for IT assimilation leads to business value. Managers should carefully consider whether and when they should champion IT innovations, particularly during the assimilation stage.

Second, managers would do well to expect greater value from IT assimilation at the business process level (versus the organizational level). Likewise, organizations reap more value from the assimilation of IT innovations that span the enterprise (versus innovations at the function level). This latter finding is consistent with a risk-reward approach. Generally speaking, enterprise innovations carry more risk than function innovations, yet the former also provide more reward when they are assimilated in organizational processes and routines.

Third, our findings suggest that top management support for IT assimilation is most beneficial in high power distance cultures. Thus, managers working in cultures that emphasize social hierarchy, authority, and distribution of power will likely see their support efforts pay off in terms of assimilation. In contrast, managers working in low power distance cultures may need to do more "selling" of the IT innovation or find creative ways to respond to user resistance (Ford et al., 2008).

5.3 Limitations

Our work is not without limitations. We encountered several situations where *k*-values were below 10; as such, these results are more uncertain and should be interpreted with caution (Switzer et al., 1992). However, most of our fail-safe *N* values were high, suggesting that most of our results are robust. One key exception is our low fail-safe *N* values for the moderator analyses related to the support-value relationship (see Table 7). Furthermore, some of our moderator analyses produced overlapping credibility intervals. In these cases, future research could take a closer look at the conditions under which the moderator has an impact. There may also be a causal dependency between process-level business value of IT and organizational-level business value of IT from IT assimilation. We were not able to account for such a dependency. Finally, although we went to great lengths to identify all empirical studies in this body of literature, we base our findings on studies that reported the statistics necessary to run meta-analytic techniques.

5.4 Conclusion

Top management support, IT assimilation, and the business value of IT are enduring constructs in the IS field. We found several insights that help scholars and practitioners working in these areas. First, explicit support may not be particularly valuable during the assimilation stage, and whether this type of support leads to business value remains an open question. Second, the benefits of IT assimilation are more likely to appear at the process level, and IT innovations that span the enterprise tend to provide more value than function innovations. Finally, macrolevel factors such as national culture can help us understand IT assimilation. We hope our study encourages future research on the nexus surrounding support, assimilation, and value.

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Appendix A

Table A1. Studies Included in the Meta-Analysis

Study	TMS→ ASSIM	ASSIM→ PERF	TMS→ PERF	*N*
Ahmad & Schroeder (2001)		0.28		85
Albadvi et al. (2007)		0.46		97
Barczak et al. (2007)	0.39	0.26	0.03	212
Barczak et al. (2008)		0.21		118
Boh et al. (2008)		0.50		60
Brosius (2018)		0.45		134
Cereola et al. (2012)	0.27	0.49	0.28	164
Chatterjee et al. (2002)	0.62			62
Chaudhury & Bharati (2014)	0.28			300
Chen et al. (2015)	0.55	0.29	0.26	161
Cooper & Molla (2014)	0.72			148
Cruz-Jesus et al. (2019)	0.35			277
de Mattos & Laurindo (2017)	0.66	0.60	0.74	95
Droge & Germain (2000)		0.17		200
Eder & Igbaria (2001)	0.37			281
Fichman & Melville (2014)		0.13		26992
Germann et al. (2013)	0.69	0.25	0.22	212
Gobhakloo & Tang (2015)	-0.07	0.68	0.41	316
Gopalakrishna-Remani et al. (2019)	0.59			147
Gunasekaran et al. (2017)	0.40	-0.01	-0.24	205
Ha & Ahn (2014)			0.21	96
Hazen et al. (2017)	0.60	0.70	0.63	190
Hill et al. (2009)		0.17		106
Hossain et al. (2011)	0.45	0.53	0.42	367
Hsia et al. (2019)	0.69			207
Hsu et al. (2012)	0.40			140
Islam et al. (2020)	0.51			191
Karimi et al. (2007)		0.51		148
Kharabe (2012)		0.55		215
Kim et al. (2016)		0.11		273
Klein (2012)		0.51		216
Ko & Liu (2019)		0.23		248
Kraemer et al. (2005)		0.30		2139
Kurokawa et al. (2008)		0.14		169
Kuruzovich (2009)		0.55		153
Lai et al. (2016)	0.24			280
Lal & Bharadwaj (2015)		0.32		235
Lee & Lim (2003)		0.18		110
Lee & Widener (2016)		0.40		241
Lee & Zo (2017)	0.54			248
Lee et al. (2012)			0.24	163
Liang et al. (2007)	0.52			77
Liang et al. (2019)		0.73		158
Lin (2014)	0.65			119
Lin et al. (2006)		0.85		257
Liu et al. (2013)		0.60		286
Malhotra et al. (2007)		0.45		41
Mishra et al. (2007)		0.36		424
Nakayama (2003)	0.37	-0.03	0.02	72
Premkumar & Ramamurthy (1995)	0.20			201
Purvis et al. (2001)	0.51			124
Rai et al. (2009)	0.39	0.47	0.22	166
Ramamurthy et al. (1999)	0.41	0.27	0.19	83
Ramamurthy et al. (2008)	0.51	0.56	0.63	117

Ranganathan et al. (2004)	0.26	0.79	0.19	176
Saini et al. (2010)	0.53	0.26	0.25	220
Sanders (2008)		0.50		241
Setia et al. (2011)		-0.03		285
Shao et al. (2016)	0.67	0.71	0.74	240
Subramani (2004)		0.36		131
Thong (1999)	0.04			120
Wang & Zander (2018)	0.51			321
Wang et al. (2008)			0.29	90
Wei et al. (2015)	0.52			102
Wieder et al. (2012)		0.19		33
Wolf et al. (2010)	0.44	0.75	0.45	189
Wolf et al. (2012)	0.33	0.44	0.23	152
Wu & Chuang (2010)		0.57		184
Wu et al. (2003)	0.47	0.44	0.38	144
Wu et al. (2016)			0.43	187
Xu et al. (2014)	0.62	0.60	0.59	176
Xu et al. (2014)		0.21		186
Xu et al. (2017)	0.59	0.81	0.57	181
Xue et al. (2013)		0.30		421
Yi (2009)	0.36	0.40	0.56	288
Yu (2005)	0.24			671
Zhang & Dhaliwal (2009)	0.45	0.59	0.34	101
Zhu et al. (2010)			0.63	65

Note: The values in Columns 2-4 are correlations. If a study employed multiple variables for the same construct, we computed the composite of the correlations involving the variables and the reliabilities.

Appendix B

Table B1. Moderator Coding

Study	Innovation	Support manifestation	Value target	Innovation scope	Power distance	Measurement type	Respondent type
Ahmad & Schroeder (2001)	EDI		process	enterprise	low	perceptual	single
Albadvi et al. (2007)	IT infrastructure		process	function	high	perceptual	single
Barczak et al. (2007)	IT for NPD	explicit	process	function	low	perceptual	single
Barczak et al. (2008)	IT for NPD		process	function	low	perceptual	single
Boh et al. (2008)	Vertical IS standards		firm	function		perceptual	multiple
Brosius (2018)	EA		firm	function	low	perceptual	single
Cereola et al. (2012)	ERP	implicit	firm	enterprise	low	perceptual	single
Chatterjee et al. (2002)	E-commerce	implicit		enterprise	low	perceptual	multiple
Chaudhury & Bharati (2014)	Cloud technologies	implicit		function	low	perceptual	single
Chen et al. (2015)	Analytics	implicit	firm	function	low	perceptual	single
Cooper & Molla (2014)	Green IT	implicit		function	low	perceptual	single
Cruz-Jesus et al. (2019)	CRM	implicit		enterprise	high	perceptual	single
de Mattos & Laurindo (2017)	SCM	implicit	firm	enterprise	high	perceptual	single
Droge & Germain (2000)	EDI		firm	enterprise	low	perceptual	single
Eder & Igbaria (2001)	Intranet	implicit		function	low	perceptual	single
Fichman & Melville (2014)	Networking		firm	function	low	objective	single
Germann et al. (2013)	Analytics	explicit	firm	function	low	perceptual	single
Gobhakloo & Tang (2015)	Admin IT	implicit	firm	function	high	perceptual	single
Gopalakrishna-Remani et al. (2019)	EMR	implicit		enterprise	low	perceptual	single
Gunasekaran et al. (2017)	Analytics	explicit	firm	function	high	perceptual	single
Ha & Ahn (2014)	ERP	implicit	process	enterprise	high	perceptual	single
Hazen et al. (2017)	EA	implicit	firm	function	low	perceptual	single
Hill et al. (2009)	EDI		firm	enterprise	low	perceptual	single
Hossain et al. (2011)	E-government	implicit	firm	function	high	perceptual	single
Hsia et al. (2019)	E-health	implicit		enterprise	high	perceptual	multiple
Hsu et al. (2012)	IT security	implicit		function	high	perceptual	single
Islam et al. (2020)	B2B	implicit		enterprise	low	perceptual	single
Karimi et al. (2007)	ERP		process	enterprise	low	perceptual	single
Kharabe (2012)	ERP		firm	enterprise	low	perceptual	single
Kim et al. (2016)	KMS		firm	function	low	perceptual	single
Klein (2012)	E-procurement		process	function	low	perceptual	multiple
Ko & Liu (2019)	IT infrastructure		firm	function	low	perceptual	single
Kraemer et al. (2005)	E-commerce		firm	enterprise		perceptual	single
Kurokawa et al. (2008)	EDI		firm	enterprise	low	perceptual	single
Kuruzovich (2009)	CRM		process	enterprise	low	perceptual	single
Lai et al. (2016)	ERP	implicit		enterprise	high	perceptual	single
Lal & Bharadwaj (2015)	CRM		firm	enterprise	high	perceptual	single

Lee & Lim (2003)	EDI		firm	enterprise	high	perceptual	single
Lee & Widener (2016)	BI		firm	function		perceptual	single
Lee & Zo (2017)	Group DSS	implicit		function	high	perceptual	single
Lee et al. (2012)	Manufacturing IT	implicit	firm	enterprise	high	perceptual	single
Liang et al. (2007)	ERP	implicit		enterprise	high	perceptual	single
Liang et al. (2019)	E-government		firm	enterprise	high	perceptual	single
Lin (2014)	KMS	implicit		function	high	perceptual	single
Lin et al. (2006)	ERP		process	enterprise	high	perceptual	single
Liu et al. (2013)	Admin IT		firm	function	high	perceptual	single
Malhotra et al. (2007)	EDI		firm	enterprise	low	perceptual	multiple
Mishra et al. (2007)	E-procurement		process	function	low	perceptual	single
Nakayama (2003)	EDI	implicit	firm	enterprise	low	perceptual	single
Premkumar & Ramamurthy (1995)	EDI	explicit		enterprise	low	perceptual	multiple
Purvis et al. (2001)	CASE tools	explicit		function	low	perceptual	single
Rai et al. (2009)	E-procurement	implicit	process	function	low	perceptual	single
Ramamurthy et al. (1999)	EDI	implicit	firm	enterprise	low	perceptual	multiple
Ramamurthy et al. (2008)	Data warehouse	implicit	firm	function	low	perceptual	multiple
Ranganathan et al. (2004)	Admin IT	implicit	firm	function	low	perceptual	single
Saini et al. (2010)	CRM	explicit	process	enterprise	low	perceptual	single
Sanders (2008)	EDI		process	enterprise	low	perceptual	single
Setia et al. (2011)	IT infrastructure		firm	function	low	objective	single
Shao et al. (2016)	ERP	implicit	firm	enterprise	high	perceptual	multiple
Subramani (2004)	SCM		firm	enterprise	low	perceptual	single
Thong (1999)	IT infrastructure	implicit		function	high	perceptual	single
Wang & Zander (2018)	IP standards	implicit		function		perceptual	single
Wang et al. (2008)	ERP	implicit	firm	enterprise	high	perceptual	single
Wei et al. (2015)	RFID	implicit		function	high	perceptual	single
Wieder et al. (2012)	BI		process	function	low	perceptual	single
Wolf et al. (2010)	EA	implicit	process	function	low	perceptual	single
Wolf et al. (2012)	Grid technology	implicit	process	function	low	perceptual	single
Wu & Chuang (2010)	SCM		process	enterprise	high	perceptual	single
Wu et al. (2003)	E-business	explicit	firm	enterprise	low	perceptual	single
Wu et al. (2016)	E-health	implicit	process	enterprise	high	perceptual	single
Xu et al. (2014)	Vertical IS standards		firm	enterprise	high	perceptual	single
Xu et al. (2014)	SCM	implicit	firm	enterprise	high	perceptual	single
Xu et al. (2017)	ERP	implicit	firm	enterprise	high	perceptual	single
Xue et al. (2013)	SCM		process	enterprise	low	objective	single
Yi (2009)	E-business	explicit	firm	enterprise	high	perceptual	single
Yu (2005)	E-procurement	implicit		function	low	perceptual	single
Zhang & Dhaliwal (2009)	SCM	implicit	process	enterprise	high	perceptual	single
Zhu et al. (2010)	ERP	implicit	firm	enterprise	high	perceptual	single

Note: Admin IT = email, spreadsheets, word processing, etc. B2B = business-to-business; BI = business intelligence; CASE = computer-aided software engineering; CRM = customer relationship management; DSS = decision support systems; EA = enterprise architecture; EDI = electronic data interchange; EMR = electronic medical records; ERP = enterprise resource planning; IP = internet protocol; KMS = knowledge management systems; NPD = new product development; RFID = radio frequency identification technology; SCM = supply chain management. Blank cells for "support manifestation" represent studies that did not measure top management support. Blank cells for "value target" represent studies that did not measure the business value of IT. Blank cells for "power distance" represent studies that collected data from both high power-distance and low power-distance cultures. We did not categorize these studies by power distance given their mixed samples.

Appendix C

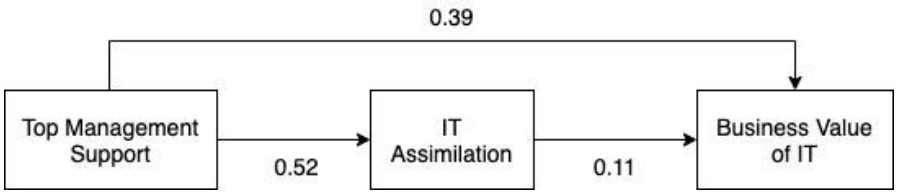
Table C1. Innovation Frequencies

Innovation	Count
Admin IT	3
Analytics	3
Business-to-business	1
Business intelligence	2
Computer-aided software engineering tools	1
Cloud technologies	1
Customer relationship management	4
Data warehouse	1
E-business	2
E-commerce	2
E-government	2
E-health	2
E-procurement	4
Enterprise architecture	3
Electronic data interchange	10
Electronic medical records	1
Enterprise resource planning	11
Green IT	1
Grid technology	1
Group decision support systems	1
Intranet	1
Internet protocol standards	1
IT for new product development	2
IT infrastructure	4
IT security	1
Knowledge management systems	2
Manufacturing IT	1
Networking	1
Radio frequency identification	1
Supply chain management	6
Vertical IS standards	2

Appendix D

Following prior meta-analytic research (Nahrgang et al., 2011), we used meta-analytic structural equation modeling and Sobel's (1982) test to assess whether IT assimilation mediates the relationship between top management support and the business value of IT. We input matrices of the estimated true score correlations into EQS 6.1 (Byrne, 2006). In order to test mediation, we simultaneously tested the direct and indirect paths of the independent variables on the dependent variables. We can infer mediation from this test if the indirect path is significant. With this in mind, we specified a model consistent with our research model (absent the moderators): top management support is related to IT assimilation, which is in turn related to the business value of IT; furthermore, top management support is also related to the business value of IT.

Our path model is just-identified (i.e., saturated); hence, this estimation does not provide model fit properties. Figure D1 depicts the standardized path estimates. Top management support is positively related to IT assimilation ($\beta = 0.52$, $p < 0.01$) and the business value of IT ($\beta = 0.39$, $p < 0.01$); IT assimilation is also positively related to the business value of IT ($\beta = 0.11$, $p < 0.01$). A Sobel (1982) test showed the indirect effect of top management support on the business value of IT through IT assimilation was significant ($\beta = 0.06$, $p < 0.01$). Overall, our results suggest that IT assimilation partially mediates the relationship between top management support and the business value of IT.



Note: All relationships significant at $p < 0.01$.

Figure D1. MASEM Results

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