THE ROLE OF INFORMATION TECHNOLOGY AS A FIRM-SPECIFIC ADVANTAGE IN INTERNATIONALIZATION OF FIRMS: THEORY AND EVIDENCE

Completed Research Paper

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Abstract

This study examines how IT influences the extent of internationalization of firms by using firm-level data on the IT investments and international operations of US multinationals for the 1999-2005 period. We identify managerial/operational complexity, geographic dispersion of subunits, and contextual differences between home and host countries as the main challenges involved in internationalization, and investigate whether IT plays a role in resolving these challenges. Our results suggest that firms’ IT capability plays an important role in their internationalization by resolving the aforementioned challenges. Moreover, a firm’s IT capability (as reflected in its IT investments) and production knowledge (as reflected in its R&D investments) are complementary in their influence on the internationalization of the firm. Given the lack of firm-level empirical evidence on the role of IT in the internationalization and global operations of firms, the current study provides a richer understanding of the impact of IT on firms’ international operations.

Keywords: Information technology, internationalization, firm specific advantage, multinational corporation.
Introduction

The internationalization of firm activities creates benefits such as increased economies of scale and scope, and the ability to utilize various location advantages (Cantwell 2009). However, internationalization also involves substantial risks and managerial challenges (Hymer 1960/1976; Johanson and Vahlne 1977; Zaheer 1995). In confronting various host country environments, firms need to learn and adapt to each different environment (Hymer 1960/1976; Zaheer 1995). Furthermore, geographic dispersion of subunits and contextual differences between home and host countries makes the communication, control and coordination difficult and costly (Vachani 1991; Zaheer and Hernandez 2011; Zaheer 1995).

Some view information technology (IT) as “the answer to the problem of going global” (Boudreau et al. 1998: 121). Prior work argues that IT can diminish the impact of space and time on firm activities, suggesting a positive association between IT and the internationalization of firm activities (Cairncross 1997; Friedman 2005; Levitt 1983). However, many of the discourses on IT and globalization are constructed largely based on anecdotal evidence (e.g., Friedman, 2005), and a number of scholars have also pointed to the limitations of IT in delivering rich nuanced messages and social contexts in communication, and its insufficient capability to transfer the tacit component of knowledge across units (Ambos and Ambos 2009; Gibson and Gibbs 2006; Teece 1977).

Despite its importance and relevance, few firm-level studies have examined how IT influences the extent of internationalization of firms. Therefore, the goal of the current study is to provide a more complete understanding of how IT influences the internationalization of firms. To this end, we synthesize the knowledge from two separate literatures: international business (IB) literature and information systems (IS) literature. The IB literature provides two insights with regard to the internationalization of firms. First, it suggests that the internationalization of firm activities is inherently difficult and costly (Cuervo-Cazurra et al. 2007; Eden and Miller 2004; Hymer 1960/1976; Johanson and Vahlne 1977; Johanson and Vahlne 2009; Zaheer 1995). Second, it suggests that firm-specific advantages (FSAs) such as a firm’s proprietary technology and managerial or organizational capability are the main driver of internationalization. These FSAs enable firms to compete globally, despite the difficulties and costs of internationalization (Buckley and Casson 1976; Caves 2007; Hymer 1960/1976; Rangan and Drummond 2004; Zaheer 1995).

The IS literature provides helpful insights into the role of IT in business value creation. In contrast to much of the previous IB studies conceptualizing IT as a non-proprietary technological infrastructure, which does not allow firm heterogeneity in utilizing IT (e.g., Ambos and Ambos 2009; Rangan and Sengul 2009; Zaheer and Manrakhan 2001), the IS literature has suggested that IT can be a firm-specific proprietary asset that generates distinct business value by influencing firm capability (e.g., Bharadwaj 2000; Bhatt and Grover 2005).

Drawing on these insights, we first define three prominent challenges involved in the internationalization of firms: 1) managerial/operational complexity; 2) geographic dispersion of subunits; and 3) contextual differences between the home and host countries. Subsequently, building on the discussion of FSA in the IB literature, we conceptualize IT as one form of FSA that enhances a firm’s organizational capability (Bharadwaj 2000). Based on this conceptualization, we argue that with an enhanced IT capability, firms can better resolve the aforementioned challenges; therefore, a firm-level IT capability directly affects the degree of internationalization of firms, as well as the choice of their subunit locations. We also argue that a firm’s IT capability can be a complementary asset to the firm’s production knowledge, together which can accelerate its internationalization. Based on these arguments, we develop and test a set of hypotheses using the data of US multinationals on their IT investments and international operations for the 1999-2005 period. Our results support most of our hypotheses, highlighting the important role of IT in the internationalization of firms.

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1 As Kirca et al. (2012) review, several terms, such as degree of internationalization, international geographic diversification, international expansion, geographic scale, scope of foreign operations, and multinationality have been used to refer to the extent to which firms are multinational. When we use the term, the extent of internationalization, we focus on the extent or level of multinational operation.
This study contributes to the literature in the following ways. First, theoretically, by recognizing IT as a firm-specific proprietary asset facilitating the internationalization of firms, we contribute to the stream of research that attempts to find specific resources needed for the internationalization of firms (e.g., Hitt et al. 2006; Nachum 2003; Zaheer 1995). Second, empirically, this study is among the first to study the impact of IT on the internationalization and global operations of firms using a large-scale firm-level dataset. Unlike prior studies that use industry-level IT data to test firm-level effects (Nachum and Zaheer 2005; Rangan and Sengul 2009) or projected firm-level IT budgets (Chari et al. 2007; Ravichandran et al. 2009), we use data on actual IT investments of firms for a more recent period than any prior published study. Also, unlike other studies that focus on firm performance impacts of IT on Tobin's Q or foreign profits (Chari et al. 2007; Mithas et al. 2012b; Ravichandran et al. 2009), we focus here on the theoretical mechanisms that explain why IT influences internationalization by selecting appropriate dependent variables based on prior work. Our study shows that a firm's capability in setting up and utilizing IT systems plays a distinct role in the internationalization of firms. Third, we provide a more complete understanding of the role played by IT in the internationalization of firms by delineating the major challenges involved in the internationalization and by empirically demonstrating the specific contributions that IT makes in resolving the challenges. Finally, we also contribute to the literature on the business value of IT by clearly showing the link between a firm's IT investments and the level of internationalization and location choice.

In what follows, we first develop a conceptual model by drawing on the previous literature and propose a set of hypotheses. We then discuss our methodology, followed by findings. Finally, we discuss the implications for both theory and practice.

**Conceptual Background**

**Difficulties in Internationalization**

In his seminal thesis, Hymer (1960/1976) seeks to answer the question of how firms run multinational business, despite the high costs involved in international operations, such as increased insurance, security and transportation delays. Zaheer (1995, 2002) later expands this concept of the costs of doing business abroad by focusing more on social/institutional costs stemming from foreign firms' weak network position and local embeddedness in host countries; she labels these costs as the liability of foreignness (LOF). She explains that LOF is incurred due to (1) the spatial distance between the firm’s home and host country units; (2) unfamiliarity with the host country’s environment; (3) a lack of legitimacy and embeddedness; and (4) unfavorable regulations and government policies to foreign firms in the market (Zaheer 1995; Zaheer 2002).

A number of studies have reported the existence of such costs that adversely affect the performance and survival of foreign firms, but are not incurred by domestic firms (e.g., Delios and Beamish 2001; Mezias 2002; Miller and Parkhe 2002; Mitchell et al. 1994; Zaheer and Mosakowski 1997). As more studies have delved into the question of what constitutes the difficulty and costs of internationalization, scholars have broadened the concept of LOF and underscore that the high costs of internationalization are incurred not only from the disadvantages of “foreignness” in host countries, but also from operational difficulties caused by the “multinationality” of the internationalized firms (Cuervo-Cazurra et al. 2007; Sethi and Guisinger 2002; Yu and Kim 2012). Sethi and Guisinger (2002) maintain that since multinational corporations (MNCs) are involved in the complex and volatile international business environment, the high costs incurred by foreign firms should be conceptualized not only by focusing on the costs arising out of unfamiliarity and discrimination in host country environments, but also by incorporating those from reading and processing the international business environment so as to formulate and implement a proper strategy that works globally.

This literature to date has suggested that the internationalization of firms involves various difficulties, which can be largely summarized as follows: 1) the operational/managerial complexity to manage global operations; 2) the geographic dispersion of subunits; and 3) the contextual differences between the home and host countries. These challenges, of course, are not mutually exclusive. However, we maintain that each challenge has its distinct element, which is worthwhile to investigate further. We discuss each of these distinct elements in further detail in the next section.
Firm-Specific Advantages and Internationalization

In the IB literature, scholars have long discussed that firm-specific advantages (FSAs) enable firms to conduct business abroad, in spite of the aforementioned difficulties (Buckley and Casson 1976; Caves 2007; Hymer 1960/1976; Rugman 1981). Various theoretical explanations have been suggested to explain how and why FSA matters to the internationalization of firms. For example, building on the internalization theory (Buckley and Casson 1976), Morck and Yeung (1998) maintain that “a multinational firm has an advantage due to firm-specific intangible assets that allow it to overcome the adversity of doing business in a foreign location. If these assets are indeed information-based, like production skills, marketing skills, and so on, then they behave like public goods in that their value increases as a firm becomes more multinational” (Morck and Yeung 1998: 167-168). In other words, since intangible assets such as proprietary technology are public goods that can be applied in new markets with proportionally smaller increments in cost, those generating advantages in the home country can be exploited in overseas markets.

Whereas studies from internalization/transaction cost theory tradition tend to focus more on the transaction characteristics of FSA in explaining its influence on internationalization, studies based on the resource-based view (RBV) (Barney 1991; Wernerfelt 1984) focus more on finding particular resources needed for the internationalization (e.g., Hitt et al. 2006; Nachum 2003). The underlying premise of the RBV studies is that possessing valuable, rare and inimitable resources provides competitive advantage (Barney 1991), based on which firms can succeed globally despite their inherited liability of foreignness (Hitt et al. 2006; Zaheer 1995). In this respect, FSA provides firms with a competitive advantage that competitors cannot easily imitate. Zaheer (1995) empirically finds that MNC subunits adopting their home-based organizational practices for employee control outperform those adapting to host country practices in the foreign currency trading rooms in Tokyo and New York City, thereby showing the importance of home-based FSA for international competition. Hitt et al. (2006) report the importance of human capital and relational capital in the internationalization of service firms.

As the above discussion suggests, although theoretical rationales for how FSA influences a firm’s internationalization vary across different theories, the common attributes of FSA highlighted by various theories concern its intangible and proprietary nature (Buckley and Casson 1976; Caves 2007; Rugman 1981). Specific examples of FSA discussed in the literature have been rent-generating intangible assets such as proprietary technology and know-how, brand equity (Buckley and Casson 1976; Rugman 1981), and cross-border coordination skills (Dunning 1980).

We extend prior work by demarcating FSA into two separate assets: 1) production technology/knowledge; and 2) organizational/managerial capability. In the IB literature, the important roles of production-related proprietary technology and know-how in the internationalization of firms have been extensively studied. In particular, R&D intensity has been used most frequently in the literature as an indicator of production knowledge, and a number of studies have reported a positive relationship between R&D intensity and the level of internationalization (i.e., multinationality) (Buckley and Casson 1976; Caves 1974; Delios and Beamish 1999; Dunning 1980; Fiegenbaum et al. 1997). Following these studies, we conjecture that a firm’s R&D intensity can capture the level of sophistication in production knowledge reasonably well; thus, we use R&D intensity as a variable to examine the level of sophistication in the production knowledge of a firm. Subsequently, we concur with these previous studies that possessing superior production knowledge is one of the critical drivers of a firm’s internationalization, since without this fundamental asset, firms will have difficulty in overcoming the high costs of internationalization and competing effectively in their host countries.

As for the second type of FSA (i.e., organizational/managerial capability), the importance of possessing managerial or organizational skills to deal with complex global operations has long been emphasized in the IB literature (Bartlett and Ghoshal 1989; Dunning 1980); however, such skills have rarely been operationalized and been examined empirically. In this respect, we argue that along with production knowledge, IT can be another form of FSA, as IT can substantially enhance a firm’s organizational/managerial capability. A detailed discussion follows below.
Understanding IT as One Form of FSA

Despite the seemingly tight link between globalization and digitization, the information and communication technologies have been discussed mostly as an implicit assumption for a firm's internationalization in the IB literature (e.g., Ghoshal 1987; Levitt 1983). Only a few studies have delved into how IT influences the strategic decisions of firms in their international expansion and multinational operation. Thus far, in relation to IT, researchers have examined the investment motives of MNCs in their foreign direct investments (e.g., market-, efficiency-, knowledge-seeking) (Nachum and Zaheer 2005), the location choice (Zaheer and Manrakhan 2001), governance choice (i.e., transnational integration) (Rangan and Sengul 2009), and knowledge transfers (Ambos and Ambos 2009). These studies have made significant contributions to building knowledge on the impact of IT in international business contexts; however, a majority of these studies have provided a very limited view on IT.

Notably, most of these studies perceive IT as “a non-proprietary infrastructure technology” (Rangan and Sengul 2009: 1500), and the main function of IT has been restricted to data storage and transmission (e.g., Ambos and Ambos 2009; Zaheer and Manrakhan 2001). This perception on IT as a non-proprietary infrastructure does not allow firm heterogeneity in dealing with IT systems, thereby suggesting the following: if companies install the same hardware or software, their impact on firm operations will be the same. Not surprisingly, with this conceptualization, few studies have examined the impact of IT at the firm level in the IB context.

We argue that in examining the role of IT in the internationalization of firms, IT should be understood beyond the function as a non-proprietary infrastructure. More specifically, IT should be understood as a firm-specific asset uniquely developed over time in each firm. This view is closely linked to RBV (Barney 1991). Based on RBV, a number of IS scholars have suggested that IT can be a firm-specific resource generating superior performance and/or sustainable competitive advantage (Bharadwaj 2000; Bhatt and Grover 2005; Mata et al. 1995; Mithas et al. 2011; Mithas et al. 2012a). In particular, Bharadwaj (2000) conceptualizes IT as an organizational capability that contributes to competitive advantages, and finds support for her argument. In the IB context, Chari et al. (2007) concur with this view and emphasize that there should be firm-level differences in the capability to leverage assets across borders, and IT can be such a capability.

We build on this view and argue that IT is a firm-specific proprietary asset that facilitates managing and organizing the multinational operations of a firm. This view underscores that even when firms install the same hardware and software, its impact on the firms’ operations and performance will differ, depending on their capability to integrate, manage and exploit IT-based resources for the following reasons. First, although the individual components of a firm’s IT infrastructure (i.e., hardware and software) tend to be commodities readily available from the market, firms need to integrate these components in a way specific to their unique context and processes in order to capture the benefits from IT infrastructure. This process of integration is highly complex, and thus causally ambiguous (Reed and Defillippi 1990), and the resulting unique IT system enables firms to “(1) identify and develop key applications rapidly, (2) share information across products, services and locations, (3) implement common transaction processing and supply chain management across the business, and (4) exploit opportunities for synergy across business units” (Bharadwaj 2000: 173).

Second, in addition to the physical IT resources (IT infrastructure), firms have different endowments of IT human resources, especially in terms of their technical and managerial IT skills (Mata et al. 1995). Technical IT skills include programming, systems analysis and design, and expertise in certain technologies, whereas managerial IT skills include abilities for managing IS functions, coordinating the interactions with users (i.e., various functional managers and employees), and managing IT projects (Capon and Glazer 1987). Strong IT human resources enable a firm to align business and IT strategies; develop cost-effective applications for various business functions; and effectively communicate and work with different business units/locations for accommodating diverse business needs (Bharadwaj 2000; Han and Mithas 2013). Further, IT employees play a boundary-spanning role by integrating knowledge between different business units and locations (Levina and Vaast 2005).

This discussion suggests that firms have different levels of capability in utilizing IT systems. Prior studies have used IT intensity (i.e., the ratio of IT investments to revenue) as a proxy for IT capability (Aral and Weill 2007; Chari et al. 2008; Han and Mithas 2013; Mithas et al. 2013; Tafti et al. 2013). The rationale is
that firms’ ability to manage and exploit IT resources – i.e., hardware, software, as well as IT human resources – depends on how intensively they invest in and use those resources (Bharadwaj 2000; Bharadwaj et al. 1999). Given that a firm’s IT investments typically capture not only the costs for purchasing hardware and software, and hiring IT personnel, but also the costs for integrating and optimizing IT infrastructure, as well as training and nurturing IT employees, we believe that IT intensity represents the differential IT capability across firms. Therefore, we use IT intensity as a variable to examine the level of capability in utilizing the IT systems of a firm.

Theory Development and Hypotheses

Based on the discussion thus far, we now develop a set of hypotheses. Our major arguments are the following: First, there are three main challenges involved in internationalization – operational/managerial complexity, geographic dispersion of subunits, and contextual difference between the home and host countries. Second, FSA enables firms to internationalize, despite these difficulties. In this respect, a firm-level capability in utilizing IT systems will be a direct driver of a firm’s internationalization, as this capability substantially enhances the firm’s organizational/managerial capability for global operations. Finally, the IT capability of a firm also facilitates the transfer and exploitation of production knowledge across borders, thereby influencing the internationalization of the firm.

Challenges from Managerial and Operational Complexity

The managerial/operational complexity intensifies as a firm deals with a greater number of subunits located in different countries, since the firm needs to continuously scan the complex international business environment in order to come up with a proper strategy (Bartlett and Ghoshal 1989; Sethi and Guisinger 2002). In particular, when firms are engaged in multinational operation, they need to cope with the dual demands of global integration and local responsiveness (Bartlett and Ghoshal 1989); therefore, the need to access and process a large amount of information and knowledge soars with the increased level of internationalization (Andersen and Foss 2005; Chari et al. 2007).

We argue that the managerial and operational complexity increases particularly when a firm’s subunits are located across different geographic regions, as compared to the case in which a firm’s subunits are concentrated in a particular region. Given that a region shares similar socio-cultural and institutional conditions, as well as similar levels of economic development and national income (Aguilera et al. 2007), an inter-regional dispersion of subunits makes it difficult for firms to reap the benefits of sharing common properties of locations (e.g., economies of scale). Moreover, the different cultural, administrative, geographic and economic roots of different regions may result in conflicts of interest with respect to decision-making and subsidiary management (Ghemawat 2001). Therefore, firms tend to have more difficulty in managing their internal operational network spanning more than a single region (Rugman and Verbeke 2007).

IT systems can reduce the overall managerial and operational complexity by helping firms more effectively manage the increased information processing demands from international operations (Chari et al. 2007). First, IT systems, such as database systems and enterprise resource planning (ERP) systems, facilitate the collection, classification, and integration of large amounts of data (Chari et al. 2007; Dewett and Jones 2001; Hasselbring 2000). This improved information processing allows firms to achieve better communication and coordination of their international subunits. More specifically, integrated planning and reporting systems enable subunits to report their progress to headquarters (HQ), and facilitate review by HQ to ensure that HQ policies are followed (Lacity and Fox 2008). In addition, groupware enables geographically dispersed units to conduct electronic brainstorming, share agendas, and coordinate various project-related activities, including planning, scheduling, and status tracking (Boutellier et al. 1998), thereby creating “information synergies” (Dewett and Jones 2001).

Second, IT-enabled information processing capacity allows firms to strike a more proper balance between standardization versus local adaptation of routines (Bartlett and Ghoshal 1989; Prahalad and Doz 1987). Researchers in the IS literature have shown that IT systems enable firms to standardize functions, such as manufacturing and R&D (Hagel and Brown 2001). At the same time, IT systems allow firms to be more responsive to various local markets. For example, firms can use technologies such as language translation
software, the Internet, and CRM systems to customize promotion schemes for local market segments, and offer personalized and differentiated products without making significant changes to the core product or service (Peppers et al. 1999; Rigby and Ledingham 2004; Sambharya et al. 2005).

Finally, IT systems enable firms to better manage and share relevant knowledge globally. For example, IT systems facilitate the capturing and sharing of knowledge by providing rich transmission channels and knowledge management systems for the transfer and absorption of knowledge across international subunits. In particular, knowledge repositories allow the sharing of corporate information and technical expertise, and knowledge directories can connect people (Hong et al. 2006; Kankanhalli et al. 2007). IT systems can also greatly expand the type, frequency, speed and volume with which firms can input, store, extract and exchange structured information and unstructured knowledge throughout their international operation (Finnegan and Longaigh 2002; Fulk and DeSanctis 1995). These systems also enable firms to locate personnel in the HQ or subsidiaries who have the best experience and capabilities to make specific decisions, and provide infrastructure to share, distribute and absorb knowledge across geographic and functional boundaries, coordinate activities, develop strategic opportunities, and improve performance (Andersen and Foss 2005; Jean et al. 2010).

In sum, IT systems help firms to resolve managerial/operational complexity from internationalization by 1) effectively managing the increased information processing needs; 2) facilitating strategic decision-making in regard to the standardization versus localization of routines; and 3) effectively managing knowledge flows across units. Given that firms have different levels of capability in achieving and utilizing IT systems, firms possessing a higher level of IT capability will have a greater capacity to deal with managerial/operational complexity. As a result, these firms will have higher levels of internationalization as reflected in higher interregional dispersion of their subunits. Therefore, we propose the following:

H1a: A firm’s IT intensity will be positively associated with the level of interregional dispersion of the firm’s subunits.

In addition to the direct impact as proposed above, IT capability can be complementary to the firm’s production knowledge in internationalization. As we discussed earlier, the importance of possessing superior production knowledge in internationalization has been well established in the IB literature. Banalieva and Dhanaraj (2013) recently report that proprietary technology reduces firms’ tendency of home region orientation in their sales, since more sophisticated technology is less imitable by other firms, and thus provides a technology advantage for them to expand beyond their familiar home regions. One important assumption underlying this logic is that such production knowledge is transferrable and exploitable across borders (Anand and Delios 1997). We argue that firms have varying levels of this ability to transfer and exploit such intangible assets across borders, and IT plays an important role in enhancing this ability. As we discussed earlier in developing H1a, IT improves the information processing, strategic decision-making, and knowledge management involving the international operation of firms. While these functions are essential for global operations in general, they play particularly important roles in managing and utilizing firms’ critical production knowledge across subunits. In particular, the IT systems facilitate concurrent work across units, thereby enabling firms to coordinate and control work routines related to particular technology effectively. Moreover, HQ can make a better decision on what to standardize versus localize and can manage knowledge flows in implementing home-based production knowledge/technology across units. Based on this discussion, we propose the following:

H1b: A firm’s IT intensity will positively moderate the relationship between the firm’s R&D intensity and the level of the interregional dispersion of the firm’s subunits.

Challenges from Geographic Distance

The geographic dispersion of operating units creates various challenges for internationalization. Here, we focus on the challenges particularly stemming from physical geographic distance involved in international operation. The unique aspects of the challenges associated with geographic distance concern high travel costs (Ghemawat 2001; Porter 1986) and time zone diseconomies (Zaheer 2000), which hamper cross-unit communication, coordination and control. In particular, the high travel costs and the different time zones prohibit frequent personal interaction, which is crucial for cross-unit knowledge transfers (Galbraith 1990; Teece 1977). Additionally, with the increased transportation costs and logistic hassles,
information asymmetry problems tend to arise between a firm’s home and host units, thereby raising the need for more control over local units (Ragozzino 2009).

Given that the distinct challenges created by geographic distance largely stem from travel costs and the different time zone issue, the core issue related to the role of IT in this regard concerns whether IT can substitute the physical travels and communication across units (McCann and Shefer 2004). Scholars have not reached a consensus on this issue of whether IT effectively reduces the impact of space and time on firm operations. A number of management scholars have pointed out that IT is not effective in delivering rich nuanced messages in communication and is not sufficiently capable of transferring the tacit component of knowledge (Gibson and Gibbs 2006; McCann 2008; Morgan 2004).

Studies in the IS literature, on the other hand, have argued otherwise and discussed the more essential roles of IT in managing geographic distance. For instance, enterprise systems such as ERP systems can facilitate the transfer of detailed information regarding the operation of subunits, thereby allowing HQ to effectively evaluate and control the subunits (Chari et al. 2007). Moreover, corporate databases encode the firm’s policies and procedures so that local subunits are fully informed and can properly perform the procedures (Finnegan and Longaigh 2002). This subsequently reduces the need for actual travel of HQ personnel to subunits for the purpose of control, coordination, and monitoring. Therefore, we believe that this enhanced coordination substantially reduces the managerial problems involved in information asymmetry caused by geographic distance.

Also, the IT-enabled intranets and other communication technologies can support the increased communication needs, both between the HQ and country units, as well as between the various country units. When used as part of a corporate network, managers in various country operations can enjoy easy and timely access to the data. Moreover, IT systems, such as electronic bulletin boards, allow employees in the HQ and different country units to exchange information and ideas (Chari et al. 2007), thereby alleviating the information asymmetry problem. Given that IT mitigates challenges from geographic distance substantially, a total geographic distance that a firm handles for its global operation will be larger in firms with a higher level of IT capability, compared to those with a lower level. Formally, we propose the following:

\[ H2a: \text{A firm's IT intensity will be positively associated with the total geographic distance between the firm's home country HQ and each of the host countries in which its subunits are located.} \]

The above discussion also suggests that the frequent and rich discussions between units with regard to utilizing home-based production knowledge with the support of IT systems can substitute person-to-person discussions and physical meetings, thereby reducing restrictions on knowledge transfers from geographic distance substantially. Therefore, we propose the following:

\[ H2b: \text{A firm's IT intensity will positively moderate the relationship between its R&D intensity and the total geographic distance between its home country HQ and each of the host countries in which its subunits are located.} \]

**Challenges from Contextual Differences**

Contextual differences between the home and host countries increase the costs for learning and adaptation (Zaheer 1995). In particular, the incompatibility of the transaction-governing norms and rules between home and host countries creates internal and external legitimacy challenges and relational hazards (Eden and Miller 2004; Kostova and Zaheer 1999), and intensifies the difficulty of transferring organizational practices within the firm (Kostova and Roth 2002).

In examining contextual differences, we particularly focus on institutional difference with regard to market governance, since the quality of market governance is the factor that firms possessing rent-generating, intangible assets (e.g., patents, production know-how, and brand equity) are more sensitive to than any other contextual factors, due to the risks involved in their market transactions (e.g., Anderson and Gatignon 1986; Erramilli and Rao 1993; Uhlenbruck et al. 2006). If a host country market is not strongly governed by well-established laws, rules and regulations, property rights are not usually well protected by legal and regulatory systems. In such an environment, firms should be concerned about the potential threat of leakage of production knowledge to local partners or agents (Oxley 1999). When
disputes arise in business transactions in such an environment, it is difficult to anticipate that a foreign firm would be treated fairly in a local judicial setting.

We argue that IT systems will effectively mitigate such problems from contextual differences especially related to market governance. First, as we have already discussed, IT systems effectively standardize work processes while allowing local adaptation when necessary. Standardization minimizes the interference of idiosyncratic local contexts. Rangan and Sengul (2009) maintain that through the support of IT, “asset specificity” declines in inter-organizational relationships (Brynjolfsson 1994). At the same time, IT also facilitates “cost-efficient and effective observability and monitoring” (Rangan and Sengul 2009: 1500), which improves the transparency in the value chain operation. A lack of transparency tends to make it more difficult for a firm to detect its business partner’s self-benefitting decisions at the expense of the benefit to the focal firm itself. As transparency in business transactions improves, the likelihood for a business partner to be involved in the expropriation of the focal firm’s assets decreases (Meyer 2001). Therefore, we expect that firms possessing a higher level of IT capability will better mitigate the risks from weak market governance; therefore, they will be able to locate their subunits in more institutionally different countries from their home country, compared to those with a lower level of IT capability. Formally, we propose the following:

\[ H_{3a}: \text{A firm’s IT intensity will be positively associated with the average institutional distance between its home country HQ and each of the host countries in which its subunits are located.} \]

Due to transaction risks, firms possessing a greater level of production knowledge may have a tendency not to choose institutionally different countries from their home country in their internationalization. We argue that with the support of IT systems in reducing the interference of local idiosyncrasies and improving the observability and transparency in business transactions, firms having a greater level of IT capability may be able to mitigate the expected risks and governance challenges related to their proprietary production knowledge. Therefore, we propose the following:

\[ H_{3b}: \text{A firm’s IT intensity will positively moderate the relationship between its R&D intensity and the average institutional distance between its home country HQ and each of the host countries in which its subunits are located.} \]

**Research Methods**

**Data**

The data for this study come from three sources. First, we obtained the data related to firm-level IT investments from *InformationWeek* surveys for the years 1999–2005. *InformationWeek* surveys are considered to be reliable, and have been frequently used in IS research (e.g., Bharadwaj et al. 1999; Han and Mithas 2013; Rai et al. 1997; Santhanam and Hartono 2003). Respondents are Chief Information Officers, Chief Technology Officers, or other senior-level IT executives of major US firms who are the most knowledgeable of firm-level IT investments and IT practices (Tallon et al. 2000). The IT investments here include spending on hardware, software, and systems, along with the salaries for IT employees and IT-related services and training.

Second, we collected data on the foreign location choices of the firms using archival data from the *Directory of American Firms Operating in Foreign Countries*, which includes all major US firms’ investments abroad. This directory has been used as a reliable source for the location choice of firms in prior IB studies (e.g., Flores and Aguilera 2007; Nachum et al. 2008). The *InformationWeek* surveys provide the names of each responding firm, and thus we matched the firms reported in the surveys with the location choice data from the Directory. This directory has been published once every two years. Therefore, we collected the location information for 1999, 2001, 2003, and 2005. Because the same firm may not appear in the *InformationWeek* surveys every year of our sample years, our data are unbalanced panel data containing biennial firm-level information over the four years.

Third, we also matched the firms reported in the *Information Week* surveys with the *Compustat* data to collect R&D expenses, revenue, and other control variables. Our final dataset has 223 firm-year observations from 89 firms (an average of 2.5 observations per firm) across the four years.
Measures

Interregional Dispersion of Subunits. Despite the growing consensus of “regional effects” in the operation of multinationals, there is no consensus or clear definition of what countries each region encompasses (Aguilera et al. 2007). Building on prior studies (Arregle et al. 2009; Banalieva and Dhanaraj 2013; Flores and Aguilera 2007), we define regions in geographic terms (as compared to sociocultural, institutional or economic terms), as a grouping of countries with physical contiguity and immediacy “the most straightforward” and “a precondition for a sense of unity or shared properties.” (Aguilera et al. 2007: 8-9). In particular, as used by Flores and Aguilera (2007), we adopt a more fine-grained partition of this geographically centered scheme defined by the United Nation’s Statistics Division as breaking up the world into 19 regions (i.e., Australia and New Zealand, Caribbean, Central America, Eastern Africa, Eastern Asia, Eastern Europe, Melanesia, Middle Africa, Northern Africa, Northern America, Northern Europe, South America, South-Central Asia, South-Eastern Asia, Southern Africa, Southern Europe, Western Africa, Western Asia, and Western Europe). Flores and Aguilera (2007) underscore that this scheme may bring new insights to the analysis of the foreign location choices of US MNCs within the last two decades.

To operationalize interregional dispersion, we use Shannon’s entropy index (Shannon and Weaver 1949). The interregional dispersion of a firm $k$ is measured as $H_k = -\sum_{i=1}^{N_k} p_i \log p_i$, where $N_k$ is the number of regions in which firm $k$ is operating, and $p_i$ is the proportion of a specific region $i$ in the firm’s international operations. For each firm, we identified all of the countries in which it is operating, and then computed $p_i$ for each region by dividing the number of countries belonging to the region by the total number of countries where the firm has sub-units. A similar measure has been used to measure interregional diversification (e.g., Hitt et al. 2006; Kim 1989; Qian et al. 2010).

Geographic Distance. Following Grosse and Trevino (1996), geographic distance between the home and host country locations was measured by the number of kilometers between the home and host locations using the website of Atlas of the World, where the distance was calculated based on the latitude and longitude of the two places. We use the city where home country headquarters are located as the home location and the capital city of a host country as the host location. We summed the geographic distance between the HQ and each host country in order to get the total geographic distance that a firm is dealing with.

Institutional Distance. In operationalizing institutional distance, scholars have used different dimensions of institutional environments, depending on the underlying discipline (Bae and Salomon 2010). Based on the notion that institutional dimensions are issue-specific (Kostova 1999), we focus on the differences between a focal firm’s home and host countries in terms of governance quality using Kaufmann, Kraay, and Mastruzzi’s (2008) World Governance Indicators (WGI) provided by the World Bank. WGI identifies six dimensions to reflect a country’s governance quality: 1) voice and accountability; 2) political stability and the absence of violence; 3) government effectiveness; 4) regulatory quality; 5) rule of law; and 6) the control of corruption. Following previous studies (e.g., Dikova and van Witteloostuijn 2007; Slangen and Beugelsdijk 2010), we average the scores of the six dimensions into a composite measure of home and host country governance quality, respectively, in the focal years (e.g., 1999, 2001, 2003, and 2005); then, we calculate the distance by subtracting the score of the home country from that of the host country. While previous studies (e.g., Dikova and van Witteloostuijn 2007; Slangen and Beugelsdijk 2010) used the estimated scores (between -2.5 to 2.5) of each dimension for their analysis, we use the percentile ranking of a given country (among 203 countries in the database) for this calculation in order to create enough variation in the distance between countries. Consistent with our hypotheses, we averaged the institutional distance between a focal firm’s home country and each of the host countries in which its subunits are located.

R&D Intensity. We capture the level of sophistication in a firm’s production knowledge by using R&D intensity, measured as the ratio of R&D expenditures to total sales, a widely used measure of firms’ technology and innovation input (e.g., Anand and Delios 2002; Banalieva and Dhanaraj 2013; Hitt et al. 1997; Kirca et al. 2011). We obtain the data from Compustat, and measure the R&D intensity for each of
our sample years. Although in theory, firms can capitalize some of their R&D and software costs, in practice few do so. Even software companies usually do not capitalize their R&D cost (Sandino and Kaplan 2001).

**IT Intensity.** We use IT intensity to capture how intensively firms invest in IT. Other studies have also used the notion of IT intensity as a proxy for IT capability (Chang and Gurbaxani 2012; Han et al. 2011). Following prior studies that use flow type measures, we measure IT intensity as the ratio of IT investments to total sales (Aral and Weill 2007; Tafti et al. 2013). To address the issues of endogeneity of IT investments, we use one-year lagged values of IT investments. InformationWeek data include the previous year’s (t-1) actual IT investments as well as projected IT investments for the current year (t); we use the former to measure IT intensity.

**Control Variables.** In addition to these main variables, we include several control variables that can impact firms’ internationalization activities. Firm size has been shown to influence the multinationality of a firm (Hitt et al. 2006; Kirca et al. 2012). We measure firm size as the log of the number of employees. A firm’s capital intensity can also affect the firm’s multinationality (Kirca et al., 2012). We measure capital intensity as the ratio of total fixed capital to total sales (Erramilli and Rao 1993). Sandino and Kaplan (2001: 7) note that "At least in the US, however, few major companies are choosing to classify any portion of their software development costs as meeting the standard for capitalization.” In addition, industry competition can be a driver of firms’ international activities (Kirca et al. 2012). To measure industry competition, we follow prior work and use the Herfindahl-Hirschman index (HHI), a measure of industry concentration, which is defined as $HHI_i = \sum_{k=1}^{n} s_{ki}^2$, where $s_{ki}$ is the market share of firm $k$ and $n_i$ is the number of firms in industry $i$. A firm’s market share is calculated as the ratio of its revenue to the sum of the revenue of all firms that belong to the same NAICS two-digit industry. The inverse of HHI is used to measure industry competitiveness. The higher an industry’s HHI, the more concentrated and the less competitive the industry is. We calculate the HHI for each NAICS two-digit industry and apply the same value of HHI to firms that belong to the same industry. Finally, to control for time-invariant sector-specific effects and year-specific effects, we include sector (NAICS two-digit) and year dummies in our estimation. Table 1 shows the variable descriptions.

**Estimation Procedure**

We test our hypotheses on interregional dispersion (H1a and H1b) using the following empirical specification:

$$IRDISP_{it} = \beta_0 + \beta_1 RDINT_{it} + \beta_2 ITINT_{it-1} + \beta_3 RDINT_{it-1} \times ITINT_{it-1} + \beta_4 SIZE_{it} + \alpha_s HHI_i + \alpha_s CAPINT_{it} + Y_t + \sum D_j + \epsilon_{it}$$

(1)

where $Y_t$ denotes the year dummy for year $t$ and $D_j$ denotes the sector dummy (NAICS 2-digit). When testing H2a and H2b, we replace $IRDISP_{it}$ by $GEODIST$, and to test H3a and H3b, we use $INSTDIST$ as the dependent variable. We centered $RDINT$ and $ITINT$ before creating the interaction term to avoid multicollinearity. We tested for multicollinearity, and the mean variance inflation factor is 1.25 and the maximum value is 1.56, indicating that multicollinearity is not a concern in our data. Arellano-Bond test for autocorrelation indicates that second-order autocorrelation (AR2) is present in our dataset ($z=4.91$, $p<0.01$).

---

2 It is common practice to replace missing R&D values with zeros (e.g., O’Brien 2003, Opler et al. 1999). As O’Brien (2003) states, “[s]ince 1975, firms have been required to expense and disclose virtually all R&D expenditures (White, Sondhi, and Fried, 1994: 397). Thus, missing values for R&D are likely the result of negligible expenditures. Furthermore, as Himmelberg et al. (1999) report, excluding firms from the analysis that do not report R&D expenditures biases the sample towards firms which make intensive investments in R&D.” After replacing missing R&D values with zeros, our sample size increased to 454, but the results were similar to those obtained from our original sample.

3 To further address the concern for endogeneity, we employed instrumental variable estimation (2SLS) with two-year lagged values of IT investments as the instrument for our one-year lagged IT investments. Although the standard errors increased quite a bit, we obtained qualitatively similar results. Also, the endogeneity tests suggest that our IT variable is exogenous ($p > 0.1$).
Breusch-Pagan test indicates that our data exhibit heteroskedasticity ($\chi^2=189.44, p<0.01$). In the presence of heteroskedasticity and autocorrelation, pooled ordinary least squares (OLS) regression may be problematic—the estimates will no longer be efficient and the standard errors will not be correct. Therefore, we use feasible generalized least squares (FGLS), which can effect appropriate adjustments (Wooldridge, 2002).

<table>
<thead>
<tr>
<th>Table 1. Variable Description</th>
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<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>Interregional dispersion</td>
</tr>
<tr>
<td>Geographic distance</td>
</tr>
<tr>
<td>Institutional distance</td>
</tr>
<tr>
<td>IT intensity</td>
</tr>
<tr>
<td>R&amp;D intensity</td>
</tr>
<tr>
<td>Firm size</td>
</tr>
<tr>
<td>Industry concentration</td>
</tr>
<tr>
<td>Capital intensity</td>
</tr>
</tbody>
</table>

Table 2 shows the descriptive statistics. In our sample, the average value of interregional dispersion is 1.77 (out of a maximum of 2.66). On average, the total geographic distance with sub-units is 194,800 kilometers, while the average institutional distance between home and host countries is 17.1. A firm’s R&D expenses account for approximately 5% of the revenue, on average. Also, an average firm in our sample spent approximately 3% of its revenue on IT investments. Table 3 provides correlations among the variables.

<table>
<thead>
<tr>
<th>Table 2. Descriptive Statistics ($N = 223$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>IRDISPER</td>
</tr>
<tr>
<td>GEODIST</td>
</tr>
<tr>
<td>INSTDIST</td>
</tr>
<tr>
<td>ITINT</td>
</tr>
<tr>
<td>RDINT</td>
</tr>
<tr>
<td>SIZE</td>
</tr>
<tr>
<td>HHI</td>
</tr>
<tr>
<td>CAPINT</td>
</tr>
</tbody>
</table>
Table 3. Correlations

<table>
<thead>
<tr>
<th></th>
<th>IRDISPER</th>
<th>GEODIST</th>
<th>INSTDIST</th>
<th>ITINT</th>
<th>RDINT</th>
<th>SIZE</th>
<th>HHI</th>
<th>CAPINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRDISPER</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEODIST</td>
<td>0.73*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTDIST</td>
<td>0.64*</td>
<td>0.65*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITINT</td>
<td>0.04*</td>
<td>0.05*</td>
<td>0.02</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDINT</td>
<td>0.13*</td>
<td>0.21*</td>
<td>0.01</td>
<td>0.18*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.37*</td>
<td>0.35*</td>
<td>0.35*</td>
<td>-0.07*</td>
<td>-0.18*</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHI</td>
<td>-0.26*</td>
<td>-0.19*</td>
<td>-0.16*</td>
<td>-0.06*</td>
<td>-0.23*</td>
<td>0.10*</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>CAPINT</td>
<td>-0.06*</td>
<td>0.03</td>
<td>0.05*</td>
<td>-0.05*</td>
<td>0.00</td>
<td>-0.07*</td>
<td>-0.04*</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Note: Pair-wise correlations; * p < 0.05.

Findings

Table 4 presents the results of estimating equation (1) using three dependent variables: IRDISPER, GEODIST, and INSTDIST. We describe the results for each below.4

IT Intensity and Interregional Dispersion

As can be seen in Model (1) of Table 4, we find that a firm’s IT intensity is positively associated with the firm’s interregional dispersion (p < 0.01). This is consistent with our argument that IT can mitigate the challenges associated with operating in multiple geographic regions, thereby supporting H1a. In H1b, we argued that IT intensity would positively moderate the relationship between R&D intensity and interregional dispersion. As shown in the Model (2) column, the interaction between R&D intensity and IT intensity is positive and significant (p < 0.05), which suggests that IT investments can help firms resolve challenges in transferring and exploiting their production knowledge across different regions. Thus, H1b is supported. Although not our focus, we find a positive and significant association between R&D intensity and interregional dispersion, which is consistent with prior studies.

IT Intensity and Geographic Distance

Models (3) and (4) show the results of estimating the equation with geographic distance as the dependent variable. We find that the unconditional effect of IT intensity on the total geographic distance is positive, but insignificant (see Model (3)). Thus, H2a is not supported. In terms of the moderating effect of IT intensity, the coefficient on the interaction term is positive and significant, which supports H2b. These results suggest that although IT alone is not sufficient to overcome the challenges stemming from geographic distance, IT can facilitate the transfer and exploitation of firms’ production knowledge. In addition, we find a positive and significant association between R&D intensity and geographic distance.

IT Intensity and Institutional distance

Models (5) and (6) present the results of estimating the model using institutional distance as the dependent variable. We find that a firm’s IT intensity is positively associated with the firm’s average institutional distance between the home and host countries, supporting H3a. Also, the coefficient on the interaction term, RDINT × ITINT, is positive and significant (p < 0.1), indicating that IT investments can help firms mitigate the risks associated with institutional distance. Thus, H3b is supported. On an additional note, we do not find a significant association between R&D intensity and institutional distance.

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4 We also estimate our models using one-year lagged values of R&D investments. Although the sample size dropped substantially (N=102), we obtained consistent results.
This may be attributable to the dual characteristics of R&D intensity, which enables internationalization but is simultaneously sensitive to the level of market governance.

In sum, our results show that firms with higher levels of IT investment intensity are more likely to have a greater degree of interregional dispersion and are more likely to deal with a longer institutional distance in their global operations. We also find that IT investments facilitate firms' internationalization by helping firms mitigate the challenges associated with operational complexity, geographic distance, and institutional distance in utilizing production knowledge across borders. Although not our focus, we also find that larger firms (higher SIZE) and firms operating in more competitive industries (lower HHI) tend to internationalize more.

### Table 4. FGLS Estimation Results

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>IRDISPER</th>
<th>GEODIST</th>
<th>INSTDIST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>RDINT</td>
<td>0.26**</td>
<td>0.234*</td>
<td>341.16***</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.129)</td>
<td>(112.28)</td>
</tr>
<tr>
<td>ITINT_t-1</td>
<td>0.96***</td>
<td>1.84***</td>
<td>123.73</td>
</tr>
<tr>
<td></td>
<td>(0.124)</td>
<td>(0.535)</td>
<td>(206.77)</td>
</tr>
<tr>
<td>RDINT × ITINT_t-1</td>
<td>17.47*</td>
<td>1899.27***</td>
<td>(6553.75)</td>
</tr>
<tr>
<td></td>
<td>(10.33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.255***</td>
<td>0.254***</td>
<td>65.07***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(4.99)</td>
</tr>
<tr>
<td>HHI</td>
<td>-0.627**</td>
<td>-0.611**</td>
<td>-354.65***</td>
</tr>
<tr>
<td></td>
<td>(0.253)</td>
<td>(0.25)</td>
<td>(72.76)</td>
</tr>
<tr>
<td>CAPINT</td>
<td>-0.162***</td>
<td>-0.166***</td>
<td>-18.56</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.033)</td>
<td>(19.44)</td>
</tr>
<tr>
<td>Year dummy</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry dummy</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wald Chi-squared</td>
<td>614.19</td>
<td>611.50</td>
<td>277.94</td>
</tr>
</tbody>
</table>

**Note:** \( N = 223 \). Signif.: *** = \( p < 0.01 \), ** = \( p < 0.05 \), * = \( p < 0.1 \).

### Concluding Discussion

This study provides new insights into the role played by IT in the internationalization of firms. We describe how IT can resolve challenges from managerial/operational complexity, geographic dispersion of subunits, and contextual differences between the home and host countries. Based on this discussion, we argue that IT is a firm-specific proprietary asset (in contrast to a non-proprietary infrastructure, as sometimes argued in the IB literature), which significantly affects the internationalization of firms, especially in terms of the extent of internationalization as well as their subunit location selections.

While anecdotal evidence, case examples, and studies using industry- or country-level data have demonstrated the influence of IT on strategic decisions of firms in international business context (e.g., Nachum and Zaheer 2005; Rangan and Sengul 2009; Zaheer and Manrakhan 2001), our study is among the first to document the significant impact of IT investments on the degree and pattern of the actual internationalization of firms. These are important findings since they show that the role of IT in this global era goes far beyond mere data storage and transmission, as IB scholars have perceived. Our study also underscores that the critical impact of IT on globalization is beyond outsourcing and offshoring, topics that have received significant attention in the IS literature.
We note three research implications of our study. First, the finding that IT intensity is positively associated with the degree of interregional dispersion of subunits suggests that IT can substantially help firms to cope with information processing demands associated with internationalization by helping firms to overcome managerial and operational complexity, a typical challenge for multinational firms. Second, the finding that IT intensity is positively associated with institutional distance suggests that IT helps firms overcome challenges from contextual differences across countries, more specifically concerning market governance. The transaction-related risks in cross-border transfer and exploitation of intangible assets has been one of the fundamental concerns in the IB literature (Buckley and Casson 1976; Caves 2007; Rugman 1981). This concern has been further amplified as many emerging countries characterized by weak market governance have joined the global marketplace (Brouthers 2002; Dikova and van Witteloostuijn 2007; Meyer et al. 2009; Oxley 1999). Given that our sample is US firms, a larger institutional distance with a host country reflects weaker market governance of that host country. In this regard, the finding of a main effect of IT intensity and its interaction effect with R&D intensity on institutional distance suggests that IT may reduce local idiosyncrasies in business transactions, thereby enabling firms to substantially mitigate the transaction-related risks confronted in various host country settings.

Finally, our results did not support for the hypotheses regarding the unconditional effect of IT intensity on the total geographic distance that a focal firm deals with in their global operations. This may imply that IT by itself may not contribute much to resolving challenges from distance per se in global operations, suggesting that geographic distance is still an important barrier to global operations (Ghemawat 2001). Interestingly, we do find an interaction effect of IT intensity with R&D intensity on geographic distance. This finding may suggest that despite the limitations of IT in transferring tacit-components of knowledge and subtle control and improvisation in knowledge-intensive work (Brown and Eisenhardt 1995; Gibson and Gibbs 2006), IT capability can help firms overcome challenges from geographic distance in transferring and exploiting their key production knowledge embodied in R&D.

Our study provides important managerial implications as well. Overall, our results suggest that managers need to perceive IT as a firm’s proprietary asset and capability, which has a significant impact on the firm’s international expansion and operations. In this sense, not only investments in hardware and software of IT, but also those in developing the creativity and talent of the IT workforce need to be taken seriously, as they determine the capability of integrating all of the IT components (also see Han and Mithas 2013). Also, by studying three dimensions of internationalization, our results provide a more specific idea about what IT can and cannot do in managing a firm’s global operations. Based on this understanding, managers will be able to leverage their IT assets for more concrete purposes.

We note some limitations of our study and opportunities for future research. First, we provide theoretical rationales for how IT contributes to the internationalization of firms by delving into the three important challenges involved in the internationalization. However, we do not specifically measure the challenges associated with internationalization such as increased managerial and operational complexity, difficulty in striking the balance between standardization versus localization, managing knowledge flows and personal interactions arising out of spatial, time zone and institutional differences. To the extent that our dependent variables are a proxy for some of these variables, this may not be a serious limitation. However, further studies that operationalize some of these measures explicitly will help to strengthen our understanding.

Second, our measures of interregional dispersion of subunits are constructed from the number of countries in which subunits are located. Different measures to capture the depth of commitment in each different country and region (e.g., the number of employees) may strengthen our findings. Third, this study does not examine the performance implications of IT investments and internationalization. Further research on how firms optimize their portfolios of IT applications in a global setting and its implications for firm performance will be a promising venue for future research.

In conclusion, this paper investigates whether and how IT influences the internationalization of firms. Theoretically, we conceptualize IT as a firm-level proprietary asset that drives the internationalization of firms. Empirically, our results suggest that firms’ IT capability plays an important role in reducing challenges from operational and managerial complexity, geographic dispersion of units, and contextual differences between home and host countries. Given the lack of firm-level empirical evidence on the role
of IT in the international business context, the current study provides a richer understanding of the impact of IT on the internationalization and global operations of firms.
References


