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RESEARCH ARTICLE

IMPACT OF INFORMATION TECHNOLOGY INFRASTRUCTURE FLEXIBILITY ON MERGERS AND ACQUISITIONS[1]

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Although mergers and acquisitions (M&A) are a common strategy to reduce costs and pursue growth, the variance in returns from M&A is very high. This research examines how information technology (IT) infrastructure flexibility affects M&A. We use a combination of secondary as well as matched-pair survey data from 100 mid-size firms in Spain to investigate this relationship. The empirical analysis suggests that IT infrastructure flexibility affects M&A through two key pathways: (1) a flexible IT infrastructure facilitates the development of business flexibility that provides the responsiveness to seize M&A opportunities and make acquisitions, and (2) a flexible IT infrastructure facilitates the development of post-M&A IT integration capability that provides the control to integrate the IT and business resources of the acquired firm and realize the economic benefits from M&A.

Keywords: Dynamic capability, IT infrastructure flexibility, business flexibility, post-M&A IT integration capability, M&A activities, post-M&A performance, business value of IT, endogeneity

Introduction

Mergers and acquisitions (M&A)[2] are perceived by top managers and firms as an important mechanism to realize cost savings and growth opportunities (Schoenberg 2006). M&A allow firms to achieve cost-based synergies through economies of scale and scope. M&A also enable firms to achieve revenue-based synergies by leveraging core capabilities (Capron 1999). The value-generating potential of M&A explains the number and size of M&A deals (Cartwright and Schoenberg 2006). In 2016, there were 96,665 M&A deals completed around the world with a total deal value of U.S. $4,734 billion (Bureau van Dijk 2017).[3] However, a large body of evidence suggests that there is significant variance in the returns from M&A (e.g., Schoenberg 2006). King et al. (2004), for example, find that M&A have a positive impact on acquirers' performance in the very short term (i.e., the day of M&A announcement), no effect in the medium term (i.e., one to three years), and a negative impact in the long term.

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The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

[2] Prior research has used the terms *mergers* and *acquisitions* interchangeably. We adopt the same convention.

[3] The global annual value of M&A deals compares favorably with the global annual IT investments (about U.S. $3.4 trillion in 2016).

Prior research has focused on two categories of variables that may explain the variance in post-M&A performance: (1) shared/complementary resources (e.g., Capron and Pistre 2002) and (2) acquirer's prior M&A experience (e.g., Hayward 2002). However, the role of information technology (IT) has not received adequate attention. In Wells Fargo's acquisition of First Interstate, the inability to integrate the customer databases of the two banks negatively affected customer service levels and led to customer attrition, decreasing Wells Fargo's ability to realize the full value of the acquisition (Popovich 2001). On the other hand, CEMEX's ability to standardize IT-enabled business process innovations and replicate them across different acquisitions helped CEMEX to redeploy its business process capabilities, integrate acquisitions, and achieve growth (Marchand et al. 2003). As these anecdotes suggest, IT can be the differentiator in enabling a firm to realize the economic benefits from M&A. However, academic research on the role of IT in M&A has been limited (Henningsson and Carlsson 2011; Lau et al. 2012; Tafti 2012; Tanriverdi and Uysal 2011). Prior work has highlighted the role of Web 2.0 technologies in environmental scanning to screen targets (Lau et al. 2012), and the importance of IT integration in M&A (Henningsson and Carlsson 2011; Tafti 2012; Tanriverdi and Uysal 2011). However, it is not clear how IT affects the acquirer's capabilities to sense M&A opportunities and achieve IT integration to create business value from M&A.

Flexibility is the organizational answer to hyper-competition as flexibility enables the responsiveness as well as the control required to deal with business opportunities and threats in hypercompetitive environments (Volberda 1996). M&A require responsiveness to identify and screen targets; and once an acquisition is made, M&A require control to integrate the assets of the target with the assets of the acquirer. Given that the data and processes required to identify and screen M&A opportunities are embedded in the IT infrastructure of the acquirer, and once an M&A is made the IT infrastructure of the target needs to be integrated with the IT infrastructure of the acquirer, the IT infrastructure of the acquirer is a natural starting point to study the impact of IT on M&A. Following dynamic capability (Helfat et al. 2007) and the business value of IT literature (e.g., Ayabakan et al. 2017 Mithas et al. 2011; Rai et al. 2015), which identifies IT capabilities as the driver of IT business value, we conceptualize a flexible IT infrastructure as a dynamic capability and examine how a flexible IT infrastructure provides responsiveness as well as control.

We posit that a flexible IT infrastructure provides responsiveness by enabling the development of the business flexibility to sense and seize M&A opportunities (i.e., acquire potential targets) before competitors do. Similarly, a flexible IT infrastructure provides control by enabling the development of the post-M&A IT integration capability to integrate acquisitions and derive value from M&A.

Our research design is a combination of secondary data and matched-pair survey data from two key respondents in 100 mid-size firms in Spain. We test the proposed model using structural equation modeling (SEM) with a combination of partial least squares (PLS) and full-information maximum likelihood (FIML) estimation.

The empirical findings indicate that IT infrastructure flexibility facilitates the development of business flexibility and post-M&A IT integration capability, where business flexibility enables firms to seize M&A opportunities by helping to screen targets and make acquisitions, and post-M&A IT integration capability helps acquirers to integrate acquisitions and improve their post-M&A performance. In this way, a flexible IT infrastructure enables responsiveness by enabling firms to *explore* opportunities from M&A by helping to find acquisition targets, and a flexible IT infrastructure enables control by helping to *exploit* opportunities from M&A by integrating acquisition targets and realizing gains in post-M&A performance (March 1991; Gibson and Birskinshaw 2004).

Theory and Hypotheses

We posit that a flexible IT infrastructure supports responsiveness by enabling the development of the business flexibility to sense and seize M&A opportunities, and a flexible IT infrastructure supports control by facilitating the development of the post-M&A IT integration capability to integrate acquisitions and derive value from M&A. Figure 1 presents the research model. In the hierarchy of capabilities (e.g., Grant 1996; Sambamurthy et al. 2003) and in the IT-enabled organizational capabilities perspective (e.g., Rai et al. 2006), lower-order capabilities require other higher-order capabilities to affect business outcomes (M&A activities and post-M&A performance in this case). In this sense, IT infrastructure flexibility is a lower-order capability that requires business flexibility (a higher-order capability) to affect M&A activities, and post-M&A IT integration capability a (higher-order capability) to influence post-M&A performance.

IT Infrastructure Flexibility, Business Flexibility, and M&A Activities

IT Infrastructure Flexibility

IT infrastructure is a firm's shared set of technical and human IT resource infrastructures that provide the foundation on which specific IT applications are run (Duncan 1995). The primary constituents of IT technical infrastructure include computing platform (hardware and operating systems), com-

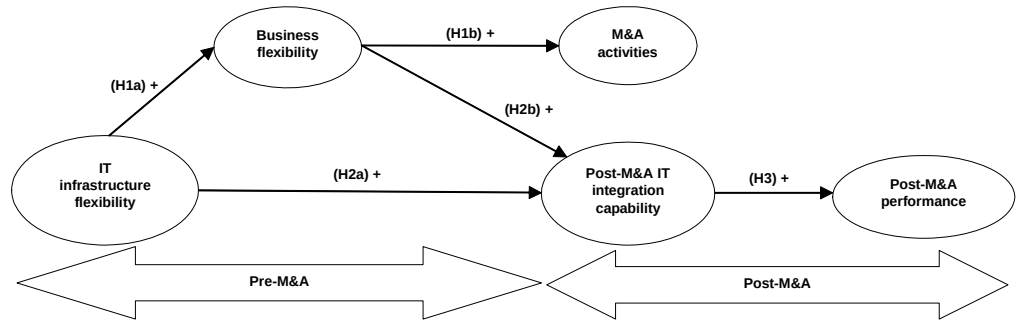


Figure 1. The Research Model

munication networks, data, and IT applications (Byrd and Turner 2000). IT human infrastructure refers to the skills of the IT personnel (Byrd and Turner 2001a). Flexibility of IT infrastructure is the capability of the infrastructure to adapt to environmental changes by enabling rapid development and implementation of IT applications (Byrd and Turner 2001a; Matook and Maruping 2014; Saraf et al. 2007; Tafti et al. 2013). Prior information systems (IS) research has traditionally suggested that IT compatibility, IT connectivity, modularity, and IT personnel skills flexibility are the key characteristics that make a firm's IT infrastructure flexible (Byrd and Turner 2000, 2001a, 2001b; Duncan 1995; Tiwana and Konsynski 2010).[4] IT compatibility is the capability to share any type of information (e.g., text, audio, video, image, etc.) across any IT component throughout the firm (Duncan 1995). IT connectivity is the capability of any IT component to communicate or be connected with any other IT component, inside or outside the firm (Byrd and Turner 2000). Standards for hardware, operating systems, and communication networks provide compatibility and connectivity (Chari and Seshadri 2004). Modularity is the capability to reconfigure (i.e., add, modify, or remove) and reuse IT components with ease and without any major overall effects (Duncan 1995). IT personnel skills flexibility refers to the business and technical skills of IT personnel such as the ability to learn new information technologies, interpret business problems, develop appropriate IT solutions, and work effectively in cross-functional teams (Byrd and Turner 2001a).

Business Flexibility

Business flexibility is the dynamic managerial capability to sense and seize opportunities for competitive action by changing the operational processes, organizational structure, and business strategies (Sambamurthy et al. 2003; Tallon and Pinsonneault 2011). In hypercompetitive environments, business flexibility provides the responsiveness to take advantage of the opportunities for competitive actions. Opportunities for competitive action cover a range of activities from launching new products, entering new markets, to completing M&A or alliances (Roberts and Grover 2012). This research is focused on opportunities from M&A. Business flexibility is conceptualized in terms of operational, structural, and strategic flexibility (Volberda 1996). Operational flexibility is the managerial capability to sense and seize business opportunities by changing factors of production and operational processes (Sambamurthy et al. 2003). Operations management variables can be changed through the possession of a broad operational repertoire, managing the supply chain with a broader and varying number of supply chain partners, and using temporary labor to adjust workforce size to shifts in demand (Volberda 1996). Structural flexibility refers to the managerial capability to sense and seize business opportunities by changing organizational structure, and decision and communication processes (Sanchez and Mahoney 1996). This capability is realized through employment of multifunctional teams and through decentralized and flexible organizational structures (Volberda 1996). Strategic flexibility is the

[4]More recently, Tallon and Pinsonneault (2011) have evaluated IT flexibility in terms of hardware compatibility, network connectivity, and software modularity, that is, only focusing on the flexibility of the technical IT infrastructure. Consistent with the more traditional works on IT infrastructure flexibility (Byrd and Turner 2000, 2001a, 2001b; Duncan 1995), we operationalize IT infrastructure flexibility as a second-order construct determined by the dimensions of IT compatibility, IT connectivity, modularity, and flexibility of IT personnel skills, for three reasons: (1) our study also aims to examine the role of flexibility of the human IT resource infrastructure (i.e., IT personnel skills flexibility) as discussions with IT executives suggested that the flexibility of personnel skills influence IT integration; (2) while IT flexibility is a moderating variable in Tallon and Pinsonneault's work, it is a primary/critical variable in our theory, to the extent that we theorize and examine the role of IT infrastructure flexibility in M&A; and (3) prior IS research has found that the flexibility of IT personnel skills are a key ingredient in shaping flexibility in the IT infrastructure (Byrd and Turner 2001a). Our empirical analysis (weight of IT personnel skills flexibility = 0.317^{***}) is consistent with prior IS research emphasizing the role of flexibility of IT personnel skills.

managerial capability to sense and seize business opportunities by changing strategies and competitive actions (Chen et al. 2017; Nadkarni and Narayanan 2007). This type of flexibility is generated through rapid development of new products and markets, and by reformulating strategies for new opportunities (Volberda 1996).

IT Infrastructure Flexibility and Business Flexibility

A flexible IT infrastructure supports responsiveness through the rapid development and implementation of IT applications that enable firms to sense and respond to changes in the environment (Matook and Maruping 2014). Specifically, compatible and interconnected IT infrastructure enables firms to share information along the supply chain and facilitates real-time collaboration with partners that increases operational flexibility (Devaraj et al. 2007; Lu and Ramamurthy 2011). For example, IT compatibility and connectivity enables firms to coordinate design and production with suppliers, and supports changes in product offerings produced in conjunction with suppliers (Wang and Wei 2007). Similarly, IT compatibility and IT connectivity enable managers to quickly search for and collaborate with new supply chain partners in response to new opportunities (Gosain et al. 2005; Saraf et al. 2007).

IT infrastructure flexibility may also enable structural flexibility. IT compatibility, IT connectivity, and modularity enable managers to provide employees with real-time information. This enables managers to decentralize decision rights and empower employees to make timely and informed decisions, increasing structural flexibility (Dean et al. 1992). Through IT compatibility and IT connectivity, IT infrastructure also facilitates cross-functional virtual teams that enable fast reconfiguration of organizational structures (Majchrzak et al. 2000). For example, by linking managers and employees through compatible and connected IT infrastructure, a flexible infrastructure enables managers to dynamically form cross-functional teams and take advantage of the diverse expertise distributed throughout the firm in a time-, location-, and rank-independent manner (Dean et al. 1992).

The compatibility and connectivity of IT infrastructure enable firms to capture and share real-time information. Thus, managers with a flexible IT infrastructure can sense new opportunities and respond with/to competitive actions (e.g., the development of new products and/or markets) by changing their current strategy, increasing firms' strategic flexibility (Chen et al. 2017; Tallon and Pinsonneault 2011). Also, environmental scanning systems allow managers to identify acquisition targets to fill gaps in its resource profile (Cordon et al. 2003; Lau et al. 2012). Similarly, a flexible IT infrastructure allows managers to analyze customer data, and identify new products and new markets.[5] Firms with flexible IT infrastructure can also develop new products and enter new markets faster (Pavlou and El Sawy 2006). A flexible IT infrastructure enables firms to share data and process resources across business units through compatible, interconnected, and modular IT infrastructure. A business unit may have valuable customer data or a unique customer service process. A flexible IT infrastructure can enable the firm to share and redeploy this customer base and/or customer service process across different business units to develop new products and/or enter new markets faster. Thus, IT infrastructure flexibility supports responsiveness by enabling managers to sense and seize new opportunities by facilitating changes at the operational, structural, and strategic levels. Therefore, we hypothesize the following:

> *Hypothesis 1a (H1a): There is a positive relationship between IT infrastructure flexibility and business flexibility.*

Business Flexibility and M&A Activities

M&A activities refer to the opportunities identified and pursued by a firm to reduce costs or achieve growth through M&A. Business flexibility enables firms to first sense opportunities, and once a firm has sensed opportunities, it can seize some of these opportunities by making acquisitions. Recent research has found support for the relationship between business flexibility and the completion of competitive actions (Roberts and Grover 2012). We extend this flexibility-competitive actions relationship to a specific kind of competitive action: M&A activities. Through operational, structural, and strategic flexibility, business flexibility may enable firms to sense and seize business opportunities such as the opportunities from M&A (Chen et al. 2017; Nadkarni and Narayanan 2007).

Operational flexibility can lead to sensing and pursuing more M&A for two key reasons. First, the interaction with more upstream suppliers and downstream customers enables the focal firm to become aware of more M&A opportunities that leads to more M&A (Shenoy 2012). Second, M&A are contagious; when a supplier A completes a horizontal M&A (e.g., acquiring a supplier B), the firm (the customer of the supplier A) responds by completing another horizontal M&A.

[5]During hurricane season in Florida, Wal-Mart was able to leverage its IT infrastructure to sense which disaster-related products were in greatest demand. These included both predictable items such as flashlights and less predictable products such as beer. Using its IT infrastructure-enabled strategic flexibility, Wal-Mart was able to deliver additional disaster-related products to stores in Florida (Overby et al. 2006).

Matching geographically and/or in size/capacity, balancing power, and avoiding dependence are the motivations for this contagion (Oberg and Holtstrom 2006). Thus, the relationship with upstream suppliers and downstream customers is one force to sense and pursue vertical (i.e., upstream and downstream) as well as horizontal M&A. In this manner, managing the value chain with multiple upstream suppliers or downstream customers (or frequently varying a small number of different suppliers/customers) increases the opportunity to sense and pursue more M&A.

Similarly, structural flexibility can enable the firm to sense and seize more M&A opportunities. Sensing and seizing of opportunities depends on the behavior of corporate development groups since these groups must take action in order to sense and seize new opportunities (Alvarez et al. 2013; Roberts and Grover 2012). These groups are likely to have greater motivation in the presence of more autonomy. To the extent that these groups are more motivated when they have more autonomy, it is plausible that they go the extra mile to sense and seize more and better M&A opportunities. There may also be a positive relationship between autonomy and entrepreneurial awareness/alertness (Alvarez et al. 2013). Firms with a decentralized and flexible organizational structure may improvise and develop a creativity-based environment in which members of the corporate development groups discern more M&A opportunities (Chandler et al. 2000). Similarly, firms that use cross-functional teams with diversity of ideas and expertise may discover more and better M&A opportunities than those with rigid organizational structures.

Finally, strategic flexibility may also lead to more M&A activities. Firms with strategic flexibility may recognize and pursue M&A opportunities before competitors (Nadkarni and Narayanan 2007). For example, a firm with a high degree of experience entering and exiting markets may sense and seize M&A opportunities before its competitors. Strategic flexibility may also help firms to seize M&A opportunities through its ability to evaluate competitors' actions and to reformulate business strategies to take advantage of new opportunities. Therefore, we hypothesize that:

Hypothesis 1b (H1b): There is a positive relationship between business flexibility and M&A activities.

IT Infrastructure Flexibility, Business Flexibility, and Post-M&A IT Integration Capability

Post-M&A IT Integration Capability

Organizational integration is the process of integrating some or all of the assets, structures, business processes, people, systems, and cultures of the acquirer and the target firm into a unified whole (Barki and Pinsonneault 2005). Organizational integration is a critical factor in realizing synergy (Cording et al. 2008; Larson and Finkelstein 1999). In this regard, post-M&A IT integration capability is the firm's dynamic capability to integrate the IT technical infrastructure, IT personnel, and IT and business processes of the target/acquired firm with the IT technical infrastructure, IT personnel, and IT and business processes of the acquirer after an M&A (Tanriverdi and Uysal 2015; Yetton et al. 2013). Post-M&A IT integration capability is a firm-level capability with a focus on M&A.[6] Thus, post-M&A IT integration capability is the control dimension of flexibility (whereas business flexibility is the responsiveness dimension of flexibility). The control provided by post-M&A IT integration capability may enable acquirers to derive economic value from acquisitions. Post-M&A IT integration capability is conceptualized in terms of IT technical infrastructure integration, IT personnel integration, and IT and business processes integration (Henningsson and Carlsson 2011; Tanriverdi and Uysal 2011). IT technical infrastructure integration is the firm's ability to integrate the IT technical infrastructures of the acquirer and the target after the M&A. IT personnel integration refers to the firm's ability to integrate the IT personnel of the acquirer and the target after the M&A. The IT and business processes integration capability is the firm's ability to integrate IT with the core business processes (e.g., customer service process) of the merged firm.

IT Infrastructure Flexibility and Post-M&A IT Integration Capability

A flexible IT infrastructure is likely to lead to post-M&A IT integration capability. Standards for compatibility and connectivity of IT infrastructure enable IT technical infrastructure integration. The capability to share, communicate, and be connected with any type of information (e.g., text, audio, video, image, etc.) across different IT components, inside or outside the firm, enable IT technical infrastructure integration. Similarly, compatibility and modularity of IT components enable firms to integrate the IT technical infrastructure and the IT and business processes of the merged firm. The compatibility and modularity of IT applications enable movement of data between applications, thus enabling the integration of the IT technical infrastructure (Chari and Seshadri 2004). IT compatibility and modularity also allow specific IT applications (i.e., digitized business processes) and components to be

[6]In Appendix A, we provide a detailed argument describing how post-M&A IT integration capability is a different construct compared to IT integration capability in the supply chain presented in prior literature (e.g., Rai et al. 2006; Rai and Tang 2010; Ward and Zhou 2006).

moved from one IT infrastructure (e.g., of the acquirer) to the IT infrastructure of the merged firm to lead to IT technical infrastructure and IT and business processes integration. Modularity also enables an acquirer to rapidly reconfigure IT applications and to adapt them to the needs of the merged firm, thus better integrating the IT technical infrastructure (Kumar 2004).

IT personnel skills flexibility enables IT technical infrastructure integration as the technical skills of IT personnel help the acquirer integrate the IT platform, data, and applications of the merged firm (Byrd and Turner 2001a). Likewise, IT personnel flexibility leads to IT human infrastructure and IT and business processes integration. The ability of IT personnel to understand the business problems of the merged firm and develop appropriate IT applications, and to work effectively in cross-functional teams with the IT and business personnel from the target lead to IT human infrastructure and IT and business processes integration. IT personnel skills flexibility also enables the development of new IT technical skills that are more compatible with the needs of the merged firm, enabling the integration of IT personnel (Saraf et al. 2007). The above discussion leads to the following hypothesis:

Hypothesis 2a (H2a): There is a positive relationship between IT infrastructure flexibility and post-M&A IT integration capability.

Business Flexibility and Post-M&A IT Integration Capability

Business flexibility is likely to increase a firm's ability to integrate its IT and business resources after completing an M&A. In other words, responsiveness may directly influence control. M&A generate a number of changes. Thus, more flexible firms may be able to reconfigure the resource base of the acquirer and target firms faster than less flexible firms. For example, operational flexibility can enable managers to reorganize their business processes. The managerial capability to move business processes from one business unit to another, to change business partners, or to move business processes from the acquirer's IT infrastructure to the merged firm's IT infrastructure can facilitate the integration of IT technical infrastructure and the integration of IT and business processes of the merged firm.

The managerial capability to change organizational structure and decision-making processes may also lead to IT personnel integration (Stylianou et al. 1996). For example, a firm with an institutionalized use of multifunctional teams is more likely to include IT and business personnel in the M&A integration plans. Such use of cross-functional teams to align business planning with IT planning, M&A planning with IT planning, and M&A strategy with IT strategy, can facilitate the integration of IT personnel, and the integration of IT and business processes (Robbins and Stylianou 1999). Finally, a firm with strategic flexibility is more likely to integrate IT and business processes after the M&A. The managerial capability to reformulate business strategies and reorganize IT and business processes to seize M&A opportunities may facilitate the integration of IT and business processes of the merged firm. Consequently, we hypothesize the following:

Hypothesis 2b (H2b): There is a positive relationship between business flexibility and post-M&A IT integration capability.

Post-M&A IT Integration Capability and Post-M&A Performance

Post-M&A performance is defined as the financial and marketing performance of the acquirer after completing an M&A (Capron 1999; Schoenberg 2006). The control provided by post-M&A IT integration capability can increase post-M&A performance through the generation of cost- and revenue-based synergies (Capron 1999). Post-M&A IT integration capability may increase the acquirer's M&A performance by consolidating the IT technical infrastructure and reducing the overall IT costs of the merged firm (Tanriverdi and Uysal 2011). The integration of IT platform, applications, and databases can also reduce the overall IT costs through IT synergies (Capron and Pistre 2002). Similarly, the integration of IT applications, databases, and business processes may create value after M&A through the minimization of costs associated with failures, delays, and disruptions in business operations (Tanriverdi and Uysal 2011).

Post-M&A IT integration capability may enable IT and business resources integration and allow acquirers to take advantage of opportunities that arise from M&A and increase post-M&A performance. Specifically, post-M&A IT integration capability may enable a firm to redeploy business resources in new markets and realize economies of scope (Capron et al. 2001). For example, an integrated IT technical infrastructure may enable the acquirer to enter new markets by marketing the products of the acquired firm to its own customer base. The integration of IT technical infrastructure and IT and business processes may also enable redeployment of process innovations (Capron et al. 2001). In this way, an integrated IT infrastructure may enable the acquirer to achieve revenue-based synergies from its business resources.

The integration of IT personnel may also lead to superior post-M&A performance of an acquirer. The integration of IT

personnel of the acquirer and target may generate cost- and revenue-based synergies by leveraging the talent and skills of IT personnel. Integration of IT personnel reduces tension, distrust, and career concerns of the target's IT personnel, reducing integration costs (Larson and Finkelstein 1999). Similarly, after an M&A, the merged firm may redeploy IT personnel from one business unit to another business unit where IT expertise is lower and increase its post-M&A performance. Therefore, we hypothesize that:

Hypothesis 3 (H3): There is a positive relationship between post-M&A IT integration capability and post-M&A performance.

Research Methodology

Data and Sample

Since no public dataset offers all of the information needed to address our research question, we conducted a survey. Given that the extant empirical research in M&A primarily studies large, public, and North American or British M&A (Cartwright and Schoenberg 2006), we collected data from mid-size firms in Spain, a market with significant M&A activity that has been explored in a very limited way. Using the Zephyr database, we developed a list with all of the 1,164 public and private Spanish firms that had completed at least one M&A deal during 2004–2008. Zephyr is a database produced by Bureau van Dijk that contains information on M&A and alliances completed by firms around the globe (https://zephyr.bvdinfo.com/).

The survey instrument was developed following the guidelines provided in prior research (Pavlou and El Sawy 2006). We pretested the questionnaire with eleven practitioners (five IT executives and six business executives) and seven experts from academia. The survey had two components and we employed two key respondents per firm: (1) an IT component to be completed by an IT executive (e.g., Chief Information Officer, IT Manager, Chief Technology Officer), and (2) a business component to be completed by a business executive (e.g., Chief Executive Officer, General Manager, Director of Corporate Development) of the firm (Chen et al. 2017). The IT component included questions about IT infrastructure flexibility, post-M&A IT integration capability, and the instrumental and control variables including data standards, network standards, object-oriented methodology, shared knowledge, prior IT integration experience, and IT investment. The business component included items related to business flexibility, post-M&A performance, and the instrumental and control variables including business process outsourcing, pre-M&A technological relatedness, acquirer's diversification, and prior experience in an M&A process.

The information about M&A activities, method of payment, and the number of acquirers' and targets' employees was obtained from the Zephyr database. Data on the acquirers' cash availability was collected from the Amadeus (https://amadeus.bvdinfo.com/) and SABI (https://sabi.bvdinfo.com/) databases. The analysis also includes a secondary measure of post-M&A performance from the *Actualidad Económica* database (http://www.actualidadeconomica.com/). *Actualidad Económica* is the premier business magazine in Spain (like *Fortune* and *Forbes* in the United States) that provides financial and other information about the most admired firms in Spain (Benitez and Walczuch 2012).

The survey was administered by a well-established market research consulting firm in Spain. This firm collected the data by phone from April to September, 2009. To do so, the firm requested an appointment with each respondent, at which time the respondent answered the survey by phone. After two reminders to nonrespondents, data were obtained from a total of 199 different firms, for an overall response rate of 17.1%. Data from 99 firms were eliminated because only one of the respondents, either the IT or the business executive, participated. Thus, the final valid number of respondent firms was 100 (92 firms were private and 8 were public). This response rate (of 8.6%) and sample size (of 100) is comparable to that of other studies with two key respondents per firm (e.g., Sabherwal and Chan 2001). The response rate can be considered as satisfactory, especially taking into account the challenge of accessing two top executives per firm. On average, responding firms had about 549 employees and fell into the following industries: banking and insurance (18%), food and beverage (14%), machinery manufacturing (10%), IT and telecommunications (9%), consulting services (7%), pharmaceutical, medical and biotechnology (7%), construction and real estate services (5%), electronics (5%), and others (25%). Nonresponse bias was assessed by verifying that early and late respondents did not differ in their responses. We considered as early respondents any of the 199 firms that responded to any part of the questionnaire in the first six weeks. All possible t-test comparisons between the means of the two groups of respondents showed nonsignificant differences. Firms in the sample had completed, on average, 3.06 M&A in the period analyzed (median = 1, standard deviation = 12.31). The average value of each M&A is 50.872 million Euros (median = 6.097, standard deviation = 112.923).

Measures

To determine the measures to be used in the study, we conducted a comprehensive analysis of prior research and

wherever possible used already validated scales. Table A1 (in Appendix A) presents the survey items used to measure the first-order constructs employed in the study. Tables C1 and C2 (in Appendix C) present the rationales for why all the constructs of this study were considered as formative at the first- and second-order levels.

Operationalization of Variables

IT Infrastructure Flexibility

Prior research (Byrd and Turner 2000, 2001b) suggests that IT compatibility, IT connectivity, modularity, and IT personnel skills flexibility are the key characteristics that a firm's IT infrastructure should possess to be flexible. Consistent with this work, we operationalized IT infrastructure flexibility as a formative second-order construct determined by four first-order constructs: IT compatibility, IT connectivity, modularity, and flexibility of IT personnel skills. We measured these four first-order constructs using scales adapted from Duncan (1995), and Byrd and Turner (2000, 2001a, 2001b).

Business Flexibility

We conceptualized business flexibility as a second-order construct determined by three first-order constructs: operational, structural, and strategic flexibility. To measure these first-order constructs, we used three scales adapted from Volberda (1996).

Post-M&A IT Integration Capability

Based on prior research (Robbins and Stylianou 1999; Stylianou et al. 1996; Tanriverdi and Uysal 2011) and the suggestions of five IT executives with experience in IT integration, we conceptualized post-M&A IT integration capability as a second-order construct determined by three first-order constructs: IT technical infrastructure integration, IT personnel integration, and IT and business processes integration capabilities.

M&A Activities

We measured M&A activities through the natural logarithm of the number of M&A per firm during 2004-2008 (Cording et al. 2008; Tafti 2012). This construct was specified as a single-indicator construct, which is adequate because of its high validity (Diamantopoulos et al. 2012).

Post-M&A Performance

We measured acquirer's post-M&A performance through the senior business executives' subjective assessments. Based on the scales developed by Hunt (1990), Capron (1999), and Schoenberg (2006) we asked each executive to assess how acquirer performance had evolved (1 = significant decline, 5 = significant increase) since the acquisition(s) completed in the period 2004–2008, in terms of sales, intrinsic profitability, earning per share, cash flow, and overall performance.

Several rationales support the use of a perceptual measure of post-M&A performance. First, prior research has shown that key respondents prefer perceptual performance measures because objective measures such as profits or costs are seen as confidential (Gruber et al. 2010). Further, 92% of the firms in our sample are privately owned and were thus not obligated to reveal performance data. Second, post-M&A performance items were answered by top business executives. The market research consulting firm that administered the survey requested an appointment with the most appropriate respondent to answer the business component of the survey (Huber and Power 1985). Specifically, in those firms that completed more than one M&A, they explicitly requested an appointment with a top business executive who had participated (holding the same/similar position) in all M&A completed by the firm in the 2004–2008 period. They checked the degree of appropriateness of the respondent before completing the survey. In the cases in which the appointed business executive was not knowledgeable enough, they asked the executive to provide the name of another top business executive that was more appropriate to answer these questions. Third, we assessed performance after a five-year M&A period (i.e., 2004–2008) and the assessment was done in the year immediately after the last year of the period (i.e., in 2009) (e.g., Hunt 1990). This five-year recall period is not considered excessive as top business executives are credited with high intellectual skills and a stronger ability to recall events than most respondent groups (Huber and Power 1985). Moreover, M&A are major organizational events and thus tend to be remembered more accurately and completely (Schoenberg 2006).

Prior studies have shown that perceptual performance measures tend to correlate highly with objective metrics, which supports their validity (Dess and Robinson 1984). We assessed the validity of our subjective performance measure by triangulating the information provided by the respondents with secondary objective performance data. The rate of sectoral excellence (RSE) is an objective measure of firms' sectoral positioning (Benitez and Walczuch 2012). The RSE

can be estimated from secondary data contained in any known ranking of firms in the following way: RSE = 1 – (Ranking position of firm / Total number of firms in the industry). In our case, the RSE was calculated based on sales ranking of the firm in their specific industry. The RSE will have a range between 0 and 1 (termed the industry's maximum value). The closer the RSE is to this maximum value for the industry, the better is the competitive position of the firm. Using objective information collected from the *Actualidad Económica* database, we estimated the RSE for the firms that made information available for the years 2007, 2008, 2009, 2010, and 2011, and calculated a formative first-order construct for the periods 2007–2011, 2008–2011, and 2009–2011. First, we correlated all of these measurements with post-M&A performance and found high correlations (0.451^{***}, 0.414^{***}, 0.46^{***}, 0.422^{***}, 0.473^{***}, 0.51^{***}, 0.509^{***}, and 0.507^{***})[7] between the scores of post-M&A performance and the RSE for 2007, 2008, 2009, 2010, and 2011, and for the periods 2007–2011, 2008–2011, and 2009–2011, respectively. Second, RSE is based on a sales ranking and thus our expectation was that RSE would be more correlated with the perceptual indicator of sales (i.e., the first indicator of post-M&A performance) than the rest of the indicators of post-M&A performance. We correlated individually all the indicators of post-M&A performance with RSE for 2007, 2008, 2009, 2010, 2011, 2007–2011, 2008–2011, and 2009–2011 (Table A2 of Appendix A). The RSE values were consistently and positively correlated with the indicator of sales. Each of these correlations is above 0.674 and each is significant at the 0.01 level. On the other hand, the individual correlations between the RSE and the other four indicators varied significantly in sign, size, and significance. These results support the validity of our subjective measure (Gruber et al. 2010).[8]

Additional Model Specification Details

The empirical analysis tests of the model were presented in Figure 1. Several measures were taken to ensure correct model estimation. It is plausible that the relationship between IT infrastructure flexibility and business flexibility potentially suffers from endogeneity due to reverse causality (i.e., business flexibility → IT infrastructure flexibility) and/or due to omitted variable bias (e.g., organizational culture). In order to examine a potential reversed causality between IT infrastructure flexibility and business flexibility, we specified a bidirectional relationship between these two constructs, and their residuals were allowed to covary (Wong and Law 1999).

To avoid problems of endogeneity in the rest of the relationships of the proposed model, we also allowed free covariances between the residuals of post-M&A IT integration capability, M&A activities, and post-M&A performance. One may conjecture that there are other factors than business flexibility and post-M&A IT integration capability that affect M&A activities and post-M&A performance respectively. For instance, a firm with a history of success in M&A activities will be more likely to engage in M&A. To avoid potential omitted variable bias, we allowed the residuals of M&A activities and post-M&A performance to covary. Similarly, it is plausible that firms with superior post-M&A IT integration capability make more M&A. Thus, we allow free covariance between the residuals of post-M&A IT integration capability and M&A activities to account for this potential endogeneity.

To facilitate the estimation of the resulting nonrecursive model, for IT infrastructure flexibility, business flexibility, post-M&A IT integration capability, and M&A activities, one or more instrumental variables are employed. Data standards, network standards, object-oriented methodology, and shared knowledge serve as instrumental variables for IT infrastructure flexibility as data and network standards, object-oriented application development methodology, and shared knowledge facilitate a flexible IT infrastructure (i.e., they are relevant instruments) (Ray et al. 2005); and they influence business flexibility only through the flexibility of the IT infrastructure (i.e., they satisfy the exclusion restriction). Business process outsourcing served as instrumental variable for business flexibility as business process outsourcing provides business flexibility (Cheng et al. 2014) and there is no theoretical rationale for business process outsourcing influencing M&A activities of firms. Firms with prior experience in IT integration may be able to develop a post-M&A IT integration capability (Robbins and Stylianou 1999). Thus, prior IT integration experience, assessed by asking the IT executive about the degree of IT integration experience before the 2004–2008 period, served as an instrumental variable for post-M&A IT integration capability. This instrument satisfies the exclusion restriction as business executives rarely consider IT integration issues when making M&A decisions (Tanriverdi and Uysal 2011). Finally, availability of cash of the acquirer was included as an instrumental variable for M&A activities, as a higher availability of cash is likely to increase the propensity

[7] $^{***}p < 0.001$.

[8] Cumulative abnormal returns (CARs) around M&A announcement dates reflect investors' response to the announcement of an M&A (Schoenberg 2006). We have not used CARs to measure our dependent variable for the following reasons: (1) although CARs may provide a useful *ex ante* measure of the investors' expectations, they are less likely to be an accurate *ex post* measure of firm performance (Haleblian et al. 2009), and (2) due to the private nature of 92% of firms in our sample, data on their share price were not publicly available, which precluded the estimation of their CARs.

of managers to take strategic actions such as M&A (Haleblian et al. 2006). We measured the acquirer's availability of cash as the average liquidity ratio of the acquirer in the year before each M&A.

We also included several control variables in our estimation. We controlled for the impact of acquirer size on M&A activities as larger firms are more likely to make acquisitions. Acquirer size was measured as the natural logarithm of the average total number of the acquiring firm's employees before each M&A. Pre-M&A technological relatedness, acquirer diversification, acquirer size, acquirer industry, prior M&A experience, method of payment, relative target size, and IT investment were included as control variables for post-M&A performance. We controlled for technological relatedness as it may affect value creation from M&A (Capron 1999). We measured pre-M&A technological relatedness using a scale proposed by Capron (1999). The item assesses whether the technology of the acquirer and the target(s) was similar before the M&A. We controlled for the acquirer's diversification as diversification may correlate with post-M&A performance (Hunt 1990). We relied on the work of Capron to measure diversification with a three-point scale (1 = conglomerate diversified into unrelated industries, 2 = firm diversified into related industries, and 3 = firm focused on one main industry). We transformed the acquirer's diversification into two dummy variables, unrelated diversification and related diversification, where the third category (firm focused on one main industry) served as the reference group. The unrelated (related) diversification dummy variable takes a value of 0 for a firm focused on one main industry, and a value of 1 for an unrelated (related) diversified firm. We created a composite construct from the two dummy variables to control for diversification (Henseler et al. 2016). In an analogous manner, we controlled for industry differences using a composite construct made up of industry dummy variables (Hayward 2002). Acquirer size was included to control for economies of scale and scope effects. Prior M&A experience was also included as a control variable as prior M&A experience is likely to positively influence the acquirer's ability to increase its post-M&A performance (Hayward 2002). We controlled for the method of payment since cash offers may reflect the synergy potential of a target and be associated with higher benefits from M&A. Method of payment was measured as the average method of payment by considering a value of 1 for all-cash offers and 0 otherwise (e.g., debt) (Tanriverdi and Uysal 2011). Since larger M&A may generate greater synergy for the acquirer (Capron 1999), we controlled for the relative target size, which was measured as the average ratio of the target's number of employees to the acquirer's number of employees (Haleblian et al. 2006). Finally, we controlled for the impact of IT investment on post-M&A performance since firms with more IT resources may have a higher post-M&A IT integration capability (Robbins and Stylianou 1999). We measured IT investment using the average annual IT investment for the years 2004–2008 using information provided by the IT executive. Table C3 (in Appendix C) presents the descriptive statistics for the instrumental and control variables.

Empirical Analysis

We employed PLS path modeling in combination with FIML SEM. This combination of methods relies on PLS as the method of choice for composite models (Dijkstra and Henseler 2015b), helps relax PLS' traditional assumption of a recursive structural model (Dijkstra and Henseler 2015a), and overcomes FIML's shortcomings when estimating models with endogenous composite constructs (Rigdon et al. 2014). We used the software ADANCO 2.0 Professional for Windows (Henseler and Dijkstra 2015) to calibrate and test the composite measurement models. For the estimation of structural model parameters and hypothesis testing we relied on R 3.1.0 (R Core Team 2014) and the Lavaan package (Rosseel 2012). The latter also facilitates mediation analyses using the Delta method.

We used PLS because it allows for a context-sensitive approximation of composites. We used the factor scheme as inner weighting scheme and correlation weights (mode A) because of the lower risk of model over-fitting (Rigdon 2012). PLS provides bootstrap-based tests of exact model fit (Dijkstra and Henseler 2015a), by means of which a confirmatory composite analysis can be conducted (Henseler et al. 2014). Confirmatory composite analysis works analogously to confirmatory factor analysis, with the main difference being that the adequacy of composite models is tested against the data. However, the core principle remains the same, namely, a comparison of the empirical correlation matrix with the model-implied correlation matrix. If the discrepancy between the two matrices is so high that it cannot be attributed to sampling variation, the composite models cannot reproduce the empirical correlation matrix and one must conclude that it is very unlikely that the world functions according to the hypothesized model. In contrast, an insignificant and small discrepancy between the empirical and the model-implied correlation matrix can be seen as empirical support for the existence of the composites. The bootstrap is used to quantify the expected sampling error for a predefined alpha level (Bollen and Stine 1992). Confirmatory composite analysis is able to detect various forms of model misspecification. In particular, it can detect a wrong assignment of indicators to constructs or a wrong number of constructs (Henseler et al. 2014). Because there are different ways to determine the

discrepancy between two matrices, we relied on three different discrepancy measures: the standardized root mean square residual (SRMR; Hu and Bentler 1998) as well as the least squares, and the geodesic discrepancy (d_{LS} and d_G, Dijkstra and Henseler 2015a).

Our analytical strategy is a three-step procedure, of which the first two steps are based on the two-step approach for second-order constructs (Ringle et al. 2012). The aim of the first step is to estimate the indicator weights of the first-order constructs and to test whether the resulting composite model can reproduce the empirical correlation matrix. The composites of instrumental and control variables were formed and tested in a separate model to avoid a nonpositive definite implied correlation matrix. The main outputs of the first step are the first-order composite scores and the composite correlation matrix. The second step aims to estimate the indicator weights of the second-order constructs and to test whether the resulting model of higher-order composites can reproduce the empirical correlation matrix of first-order constructs. Confirmatory composite analysis is used to test whether the structure of measures/dimensions of second-order constructs holds. The main output of the second step is the second-order composite correlation matrix. Finally, the third step uses the outcomes of the previous two steps and estimates the structural model parameters (including the goodness of model fit) and tests the hypotheses. Figure 2 presents the results of the model estimation.

Prior to performing the empirical analysis, we completed a statistical power analysis to determine the minimum sample size required to estimate the proposed model. Assuming an anticipated effect size of 0.2, a desired statistical power level of 0.8, ten predictors (i.e., the number of links received by the construct post-M&A performance), and a confidence level of 0.95, the minimum required sample size to estimate the model is 91 (Cohen 1988). Moreover, Henseler et al. (2014) have demonstrated that a confirmatory composite analysis can detect various forms of model misspecification at a sample size of 100.

Measurement Model Evaluation

Formative measurement requires a specific assessment of validity. We evaluated the content validity and performed an analysis of multicollinearity, weights, and loadings for our constructs (Cenfetelli and Bassellier 2009).[9] First, we assessed whether the indicators of first-order constructs and the dimensions of second-order constructs captured the full domain of the constructs. To do this, before the data collection, we ensured that the indicators and dimensions had content validity by starting from the theoretical foundations established in prior research and by pretesting the questionnaire with 18 experts from practice and academia.

After the data collection, we examined multicollinearity by calculating variance inflation factors (VIFs) at the first- and second-order level. Although all VIF values were below ten and thus do not indicate serious multicollinearity problems (Gruber et al. 2010; Petter et al. 2007), some indicators of first-order constructs yielded VIF values close to five. The choice of correlation weights for the indicators of the first-order constructs thus appeared warranted.

We also examined whether the weights and loadings of indicators and dimensions are significant (Cenfetelli and Bassellier 2009). All except two of the indicators' weights were significant at 0.05 level. One of these two weights was close to significant (at 0.10 level) and the other one was not significant but its loading was (at 0.001 level). We kept these two indicators to preserve content validity (Cenfetelli and Bassellier 2009). All the indicators' loadings were significant at 0.001 level. At the second-order level, all the dimensions' weights and loadings were significant at 0.001 level.

Finally, we assessed the validity of all composites by means of confirmatory composite analysis (Henseler et al. 2014). Table A3 shows the results for all three partial models (i.e., the model of first-order constructs, the model of instrumental and control variables, and the model of second-order constructs). We found that no matter which discrepancy between the empirical and the model-implied covariance we look at, the discrepancies are so small that it is not unlikely that they originate from sampling variation. All discrepancies were below the 95%-quantile of the bootstrap discrepancies, which means that none of the partial models should be rejected based on an alpha level of 0.05. Overall, the evaluation of the measurement models at all levels suggests that there is empirical support for the structure of composites and that our measures have good measurement properties. Table A4 presents the correlations of the constructs at second- and first-order levels. Table C4 presents the cross-loadings of the constructs.

Structural Model Evaluation

Tests of Endogeneity and Model Fit

A series of Hausman tests reveal a certain degree of endogeneity with regard to the effects of post-M&A IT integration

[9]Weights measure the relative contribution of an indicator to its construct. Loadings refer to the bivariate correlation and measure the absolute contribution of an indicator to its construct (Cenfetelli and Bassellier 2009).

capability on post-M&A performance ($\chi^2 = 4.174$, d.f. = 1, p = 0.041) and M&A activities ($\chi^2 = 4.405$, d.f. = 1, p = 0.036), whereas business flexibility's effects on post-M&A IT integration capability ($\chi^2 = -0.663$, d.f. = 1, p = 1.000) and M&A activities ($\chi^2 = 0.476$, d.f. = 1, p = 0.490) appear unaffected by endogeneity. The final model thus included free covariances between the residuals of post-M&A IT integration capability and post-M&A performance as well as between the residuals of post-M&A IT integration capability and M&A activities.[10]

Our next concern was the goodness-of-fit of the final model. The test of exact model fit indicated that the discrepancy between the empirical and the implied covariance matrix is not significant ($\chi^2 = 72.349$, d.f. = 57, p = 0.083), which means that it cannot be ruled out that the remaining model misfit is purely attributable to sampling variation. We also assessed the most common measures of approximate model fit. The SRMR was 0.051, which is clearly below the suggested threshold of 0.08 (Hu and Bentler 1998). The RMSEA was 0.052 with a 90% confidence interval of [0.000, 0.085]. Other measures of approximate fit included the CFI (0.947), the TLI (0.921), and the IFI (0.952), all of which are above 0.90. We concluded that the fit of our model is excellent and sufficient to proceed.

Test of Hypotheses

Table 1 shows the results of the structural model estimation. We find support for all of the hypotheses except for H2b. In particular, consistent with H1a and H1b, the empirical analysis suggests that IT infrastructure flexibility enables the development of business flexibility (standardized path coefficient $\beta = 0.566$, $p_{one\text{-}tailed} < 0.001$), and business flexibility enables firms to sense and seize M&A opportunities ($\beta = 0.198$, $p_{one\text{-}tailed} < 0.05$). Similarly, consistent with H2a, IT infrastructure flexibility enables the development of post-M&A IT integration capability ($\beta = 0.472$, $p_{one\text{-}tailed} < 0.001$). However, the effect of business flexibility on post-M&A IT integration capability (H2b) is not significant ($\beta = 0.059$, $p_{one\text{-}tailed} = 0.220$). This may suggest that responsiveness does not directly improve control. Finally, per H3, post-M&A IT integration capability enables firms to integrate the M&A and helps to improve post-M&A performance ($\beta = 0.672$, $p_{one\text{-}tailed} < 0.05$).

All of the instrumental variables were significant at the 0.05 level, which suggests that these variables are strong instruments. As per the control variables, the empirical analysis suggests that acquirer size persuades firms to pursue M&A opportunities, and also goes along with a higher post-M&A performance. Also, pre-M&A technological relatedness and diversification seem to result in a higher post-M&A performance.

M&A Activities and Post-M&A Performance

It may be argued that acquisitions increase post-M&A performance and thus M&A activities can directly influence post-M&A performance. We did not hypothesize a direct and positive link between M&A activities and post-M&A performance as prior research suggests that M&A activities per se do not improve post-M&A performance (Cording et al. 2008; Zollo and Singh 2004). We, however, empirically explored this possibility by adding a link between M&A activities and post-M&A performance but keep every other relationship the same. The link between M&A activities and post-M&A performance is not significant ($\beta = 0.024$), which is consistent with prior research.

Sample Selection Bias and Halo Effects Analyses

There may also be a selection concern with the data. We examined both the sample selection issue and the potential halo effects[11] simultaneously. One may argue that executives and firms that were more successful in prior M&A may be more enthusiastic to participate in the survey/study (i.e., sample selection issue). Similarly, the perception on post-M&A performance may be influenced by prior performance (i.e., halo effects). We examined the selection issue and the existence of halo effects in two ways. First, we explored whether the RSE for 2004, 2005, and 2006 correlated with perceptual measure of post-M&A performance (Santhanam and Hartono 2003). The correlations between post-M&A performance and RSE for 2004, 2005, and 2006 are 0.284^{***}, 0.244^{***}, and 0.211^{**} respectively. While these correlations are positive and significant, they are low. Second, we created the construct pre-M&A performance (as a composite of RSE for 2004, 2005, and 2006), and estimated a model in which we controlled for the impact of pre-M&A performance on post-M&A performance (see Table A5). The results are consistent with the results of the base model. These analyses suggest that sample selection bias and halo effects are not a significant concern in our model.

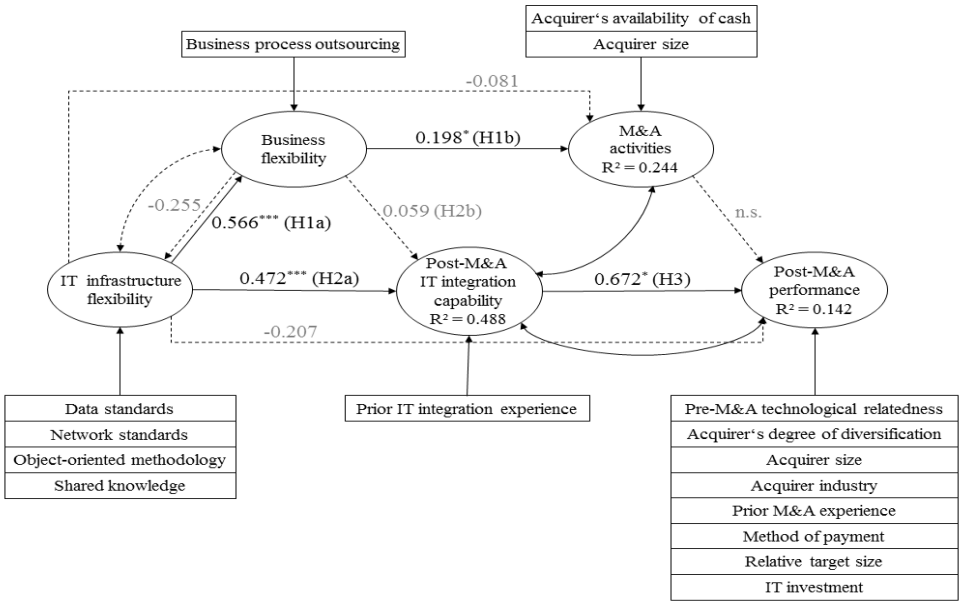
[10]The final model also allowed free covariances between the residuals of IT infrastructure flexibility and business flexibility to estimate the bidirectional relationships between these two variables. Appendix B presents a technical detail on SEM and PLS path modeling, and endogeneity.

[11]Halo effects refer to the potential influence of prior performance on perceptions of current performance (Santhanam and Hartono 2003).

Table 1. Structural Model Results

Dependent Variable / Independent Variable	Hypothesis	Standardized Path Coefficient	Unstandardized Path Coefficient		
		Value	Significance	Value	Standard Error
Business flexibility					
IT infrastructure flexibility	H1a	0.566	***	0.566	0.102
Business process outsourcing		0.182	*	0.187	0.087
IT infrastructure flexibility					
Business flexibility		-0.255	n.s.	-0.255	0.423
Data standards		0.459	***	0.455	0.116
Network standards		0.328	***	0.254	0.071
Object-oriented methodology		0.461	***	0.418	0.102
Shared knowledge		0.422	***	0.498	0.124
M&A activities					
Business flexibility	H1b	0.198	*	0.151	0.079
IT infrastructure flexibility		-0.081	n.s.	-0.062	0.081
Acquirer's availability of cash		0.174	*	0.011	0.006
Acquirer size		0.391	***	0.170	0.040
Post-M&A IT integration capability					
IT infrastructure flexibility	H2a	0.472	***	0.459	0.085
Business flexibility	H2b	0.059	n.s.	0.057	0.074
Prior IT integration experience		0.369	***	0.262	0.055
Post-M&A performance					
Post-M&A IT integration capability	H3	0.672	*	0.690	0.353
IT infrastructure flexibility		-0.207	n.s.	-0.207	0.249
Pre-M&A technological relatedness		0.261	**	0.177	0.070
Acquirer's diversification		0.274	**	0.264	0.109
Acquirer size		0.285	**	0.162	0.065
Acquirer industry		0.069	n.s.	0.069	0.109
Prior M&A experience		0.008	n.s.	0.006	0.093
Method of payment		-0.076	n.s.	-0.223	0.465
Relative target size		-0.221	n.s.	-0.171	0.105
IT investment		0.059	n.s.	0.061	0.100

*p < 0.05; **p < 0.01; ***p < 0.001 (one-tailed test)



Solid/dashed lines represent the strength of statistical significance. The variables in the rectangles are instrumental or control variables. The arrows from IT infrastructure flexibility to M&A activities and from IT infrastructure flexibility to post-M&A performance correspond to the mediation analyses. Double-headed arrows denote free correlations between residuals.

Figure 2. Graphical Representation of the Results

Mediation Analyses

We performed two mediation analyses to examine if business flexibility mediates between IT infrastructure flexibility and M&A activities (i.e., mediation analysis 1), and to examine whether post-M&A IT integration capability mediates the impact of IT infrastructure flexibility on post-M&A performance (i.e., mediation analysis 2). We followed the approach for mediation analysis suggested by Zhao et al. (2010), which indicates that a positive test of an indirect effect builds the basis for mediation. If a significant indirect effect is detected, the next test focuses on the direct effect and depending on its outcome one can distinguish between a full or a partial mediation (Zhao et al. 2010).

In the first mediation analysis, the central condition is fulfilled. The indirect effect of IT infrastructure flexibility on M&A activities has a value of 0.112 ($p_{one\text{-}tailed} < 0.05$). Because the direct effect of IT infrastructure flexibility on M&A activities is not significant (see Table 1), we can speak of full mediation. Regarding the second mediation analysis, the indirect effect of IT infrastructure flexibility on post-M&A performance has a value of 0.317 ($p_{one\text{-}tailed} < 0.05$). Again, the direct effect is insignificant. This suggests that post-M&A IT integration capability fully mediates the relationship between IT infrastructure flexibility and post-M&A performance. Overall, the mediation analyses are in line with the findings reported in Table 1. IT infrastructure flexibility enables the business flexibility to sense and seize M&A opportunities. Moreover, IT infrastructure flexibility enables post-M&A IT integration capability, which in turn helps acquirers to integrate M&A and realize the economic benefits of M&A. Figure 2 presents a graphical representation of the results.

Discussion and Conclusions

M&A are perceived by top managers as an attractive way to grow. However, the failure rate of M&A is around 50% (Schoenberg 2006). Although prior research has examined a number of different antecedents that may explain the variance in post-M&A performance, our understanding of the role of IT in M&A is limited (Henningsson and Carlsson 2011; Lau et al. 2012; Tafti 2012; Tanriverdi and Uysal 2011). Building on the business value of IT literature (e.g., Mithas et al. 2011; Rai et al. 2015) that identifies IT capabilities as the driver of IT value, we conceptualize a flexible IT infrastructure as a dynamic capability and explore how a flexible IT infrastructure can help to generate returns from M&A.

The analysis indicates that IT infrastructure flexibility has a positive relationship with business flexibility and business flexibility enables firms to sense and seize M&A opportunities. This finding suggests that a flexible IT infrastructure enables managers to change a firm's resources base by searching for and coordinating with different business partners, reorganizing organizational structure and decision-making processes, and adapting business strategies to take advantage of new opportunities. Such business flexibility, in turn, helps managers to sense and seize M&A opportunities. The mediation analysis also provides evidence that IT infrastructure flexibility helps firms to sense and seize M&A opportunities by enabling the development of business flexibility.

This research introduces and develops the construct "post-M&A IT integration capability," which builds on the construct "cross-business IT integration capability" suggested by Tanriverdi and Uysal (2011). Tanriverdi and Uysal defined and operationalized cross-business IT integration capability in terms of relatedness of IT infrastructure, IT applications and data, IT human resource management practices, IT vendor management practices, and strategy-making processes across different units of diversified firms. We define and operationalize post-M&A IT integration capability as a firm's ability to integrate the IT technical infrastructure, IT personnel, and IT and business processes of the target with the IT technical infrastructure, IT personnel, and IT and business processes of the acquirer after an M&A. Thus, though we draw from Tanriverdi and Uysal's work to build, validate, and test post-M&A IT integration capability, it is different from cross-business IT integration capability in definition and measurement, as post-M&A IT integration capability is closely situated in the M&A context (Suddaby 2010).

The results indicate that IT infrastructure flexibility has a positive relationship with post-M&A IT integration capability. The standards for the compatibility and connectivity of IT technical infrastructure, modularity of IT components, and flexibility in IT human infrastructure enable firms to integrate their IT technical and IT human resource infrastructures, and the IT and business processes of the merged firm. The results also suggest that post-M&A IT integration capability is associated with improved post-M&A performance. This suggests that the capability to integrate IT technical and IT human resource infrastructures, and to integrate IT and business processes enable firms to realize cost-based synergies by consolidating IT infrastructures and realize revenue-based synergies by redeploying information and knowledge assets such as customer base and business process innovations. The mediation analysis also provides evidence that IT infrastructure flexibility impacts post-M&A performance through post-M&A IT integration capability. This finding reinforces the idea that IT infrastructure flexibility enhances post-M&A performance through the capability to integrate the IT and business resources of the merged firm.

Lau et al. (2012) highlighted the role of Web 2.0 technologies in environmental scanning to screen targets. Similarly, Tanriverdi and Uysal showed that cross-business IT integration capability is associated with post-M&A performance. Our study adds IT infrastructure-enabled business flexibility and IT infrastructure-enabled post-M&A IT integration capability as the dynamic capabilities through which IT affects M&A. Specifically, we present two mechanisms and pathways through which IT affects M&A. First, IT infrastructure flexibility affects M&A through the business flexibility to sense and seize M&A opportunities. In this way, IT infrastructure flexibility provides the responsiveness to explore opportunities from M&A (March 1991). Second, IT infrastructure flexibility improves post-M&A performance through the post-M&A IT integration capability to integrate M&A. Thus, IT infrastructure flexibility provides the control to exploit opportunities from M&A by helping to realize gains from M&A (March 1991). These two mechanisms through which IT infrastructure flexibility affects M&A are the primary contributions of this study. In this regard, Kathuria and Konsynski (2012) argue that IT capabilities may support ambidexterity. Likewise, we find that IT infrastructure flexibility supports ambidexterity in the M&A context. IT infrastructure flexibility-enabled business flexibility improves the firm's responsiveness to explore new M&A opportunities. Also, IT infrastructure flexibility-enabled post-M&A IT integration capability improves firm's control to exploit these opportunities and create business value from M&A.

In the hierarchy of capabilities and in the IT-enabled organizational capabilities perspective (e.g., Ayabakan et al. 2017; Rai et al. 2006), lower-order capabilities require higher-order capabilities to affect business outcomes. In this regard, this study demonstrates how IT infrastructure flexibility, a lower-order capability, helps to affect business outcomes through the development of business flexibility, a higher-order capability that influences M&A activities; and how IT infrastructure flexibility helps to create business value through the development of post-M&A IT integration capability, a higher-order capability that influences post-M&A performance. In this way this research contributes to the business value of IT literature by demonstrating the mechanisms through which an IT capability, a flexible IT infrastructure creates value in M&A. Another distinctive feature of this study is that the extant empirical research in M&A primarily studies large, public, and North American or British M&A (Cartwright and Schoenberg 2006). In contrast, we focused on mid-size firms in Spain, a market with significant M&A activity that, however, has been explored in a very limited way.

The results of this study have important implications for managers. The study suggests that a firm with a flexible IT infrastructure will be in a better position to develop the business flexibility to sense and seize opportunities from M&A. Second, the study suggests that post-M&A IT integration capability is easier to develop in firms with flexible IT infrastructure. The failure rate associated with M&A is quite high (Schoenberg 2006). Similarly, firms spend millions of Euros on IT (Benitez and Walczuch 2012; Kohli and Devaraj 2003; Ravichandran and Liu 2011; Sabherwal and Jeyaraj 2015). The finding that post-M&A IT integration capability can increase acquirers' post-M&A performance is important for managers seeking to create value from M&A. Likewise, the finding that IT infrastructure flexibility increases post-M&A performance indirectly through business flexibility and post-M&A IT integration capability is useful for managers seeking to generate greater returns from their IT investments.

This research has some limitations that suggest directions for future work. First, although we controlled for IT investment to account for the cost of developing a flexible IT infrastructure and post-M&A IT integration capability, business flexibility is not costless. It is important to understand how business flexibility is developed and if its value in terms of post-M&A performance benefits are commensurate with its cost. Second, the theoretical development in this study is at the second-order level (e.g., IT infrastructure flexibility, business flexibility, post-M&A IT integration capability). Future research can pursue first-order level theoretical development. For example, it may be valuable to study the impact of modularity of IT infrastructure on structural flexibility and IT technical infrastructure integration. Finally, in this paper we focused on the flexibility of the acquirer's IT infrastructure. It is plausible that the relatedness between the IT infrastructure of the acquirer and the IT infrastructure of the target may also influence post-M&A performance. Similarly, it would be interesting to examine if pre-M&A technological relatedness of the target moderates the impact of post-M&A IT integration capability on post-M&A performance.

In conclusion, this research examined how IT infrastructure flexibility affects M&A. Using a fine-grained two key respondents survey dataset from a sample of 100 mid-size firms in Spain, this study presents two mechanisms and pathways through which IT infrastructure flexibility affects M&A: (1) IT infrastructure flexibility provides responsiveness through the business flexibility to sense opportunities from M&A, and (2) IT infrastructure flexibility provides control through the post-M&A IT integration capability to create value from M&A.

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RESEARCH ARTICLE

IMPACT OF INFORMATION TECHNOLOGY INFRASTRUCTURE FLEXIBILITY ON MERGERS AND ACQUISITIONS

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Appendix A

Difference between Post-M&A IT Integration Capability and IT Integration Capability in the Supply Chain

Post-M&A IT integration capability is a different construct compared to IT integration capability in the supply chain presented in prior literature (e.g., Rai et al. 2006; Rai and Tang 2010; Ward and Zhou 2006). IT integration capability in the supply chain refers to the firm's ability to integrate systems, data, and information with the suppliers' (customers') systems, data, and information (Rai et al. 2006; Rai and Tang 2010). Post-M&A IT integration capability refers to firm's ability to integrate the IT technical infrastructure, IT personnel, and IT and business processes of the target with the IT technical infrastructure, IT personnel, and IT and business processes of the acquirer after an M&A. The scope of post-M&A IT integration capability is M&A instead of the supply chain (Suddaby 2010). While IT integration in the supply chain is mainly concerned with exchanging data and information with suppliers (customers) to achieve integration of the supply chain; post-M&A IT integration pursues integration of the technical, human, and business process infrastructures of the acquirer and the target firm to develop one integrated IT infrastructure for the merged firm. In this way, the difference between IT integration capability for supply chain and post-M&A IT integration capability is analogous to the difference between arms-length coordination between two separate organizations and internal coordination between two independent business units that are co-owned. Specifically, IT integration in the supply chain involves interconnected processes and standardization in the information that is exchanged between independent firms to achieve coordination in the supply chain (Gosain et al. 2005). However, in post-M&A IT integration, the acquirer and the target strive for standardization in all the data and business processes in the merged firm, not just the supply chain processes, and the integration of the human infrastructure of the target into the human infrastructure of the acquirer. Similarly, the scope of M&A integration is greater than supply chain integration. The maximum level of supply chain integration would be vertical integration. However, an M&A integration can also be horizontal or a conglomerate acquisition (Fan and Lang 2000).

Table A1. Detailed Information on Survey Items

Except where otherwise indicated in the table below, the possible range for measures was from 1 to 5 (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree)

Construct/Indicator	VIF	Weight	Loading
IT compatibility (mean = 3.527, standard deviation = 0.887)	1.744	0.27***	0.77***
Software applications can be easily transported and used across multiple platforms	1.316	0.266***	0.663***
Our firm provides multiple interfaces or entry points (e.g., web access) for external end users	1.794	0.29***	0.81***
Our firm establishes corporate rules and standards for hardware and operating systems to ensure platform compatibility	1.718	0.429***	0.849***
Data captured in one part of our orgn. are immediately available to everyone in the firm	1.488	0.299***	0.755***
IT connectivity (mean = 3.807, standard deviation = 0.882**)**	1.882	0.321***	0.829***
Our organization has electronic links and connections throughout the entire firm	1.299	0.211***	0.517***
Our firm is linked to business partners through electronic channels (e.g., websites, e-mail, wireless devices, electronic data interchange)	1.626	0.342***	0.79***
All remote, branch, and mobile offices are connected to the central office	1.544	0.434***	0.834***
There are very few identifiable communications bottlenecks within our firm	1.415	0.357***	0.723***
Modularity (mean = 3.284, standard deviation = 0.783)	2.003	0.333***	0.853***
Our firm possesses a great speed in developing new business applications or modifying existing applications	1.35	0.299***	0.704***
Our corporate database is able to communicate in several different protocols	1.801	0.349***	0.794***
Reusable software modules are widely used in new systems development	1.841	0.361***	0.829***
IT personnel use object-oriented and prepackaged modular tools to create software applications	1.218	0.33***	0.645***
IT personnel skills flexibility (mean = 3.643, standard deviation = 0.701)	1.576	0.317***	0.768***
Our IT personnel have the ability to work effectively in cross-functional teams	1.547	0.35***	0.76***
Our IT personnel are able to interpret business problems and develop appropriate technical solutions	1.553	0.293***	0.72***
Our IT personnel are self-directed and proactive	1.396	0.379***	0.738***
Our IT personnel are knowledgeable about the key success factors in our firm	1.523	0.319***	0.762***
Operational flexibility (mean = 2.836, standard deviation = 0.945)	1.192	0.336***	0.663***
Our organization uses temporary personnel to perform/execute business activities	1.312	0.221*	0.64***
Our firm uses its quick-response routines to reduce uncertainty	1.712	0.468***	0.874***
Our firm has an extensive operational repertoire	1.21	0.259**	0.577***
Our firm uses crash teams (that are developed quickly to solve an unexpected problem)	1.356	0.399***	0.753***
Structural flexibility (mean = 3.511, standard deviation = 0.652)	1.25	0.484***	0.79***
Our firm has an empowerment (more decision making authority for employees) culture	1.179	0.257**	0.552***
Our firm facilitates the development of self-managed teams	1.218	0.252*	0.461**
In our firm we apply horizontal extension of responsibilities (job enlargement), that is, the ability to perform a broader repertoire of activities	1.84	0.408***	0.831***
Our organization implements training and learning practices to stimulate flexible attitudes among the firm's members	1.758	0.356***	0.785***
In our firm we create cross-functional teams	1.117	0.282**	0.441**

Construct/Indicator	VIF	Weight	Loading
Strategic flexibility (mean = 3.502, standard deviation = 0.741)	1.283	0.49***	0.805***
Our firm can increase with ease the variety of products (good and/or services) for delivery	1.494	0.229***	0.705***
Our firm dismantles current strategies quickly with low costs	1.458	0.332***	0.746***
Our firm creates new product market combinations	1.585	0.318***	0.786***
Our firm periodically adopts new technologies	1.309	0.204**	0.599**
Our firm influences consumers through advertising and promotions	1.598	0.292***	0.754***
IT technical infrastructure integration (mean = 3.508, standard deviation = 0.937)	3.066	0.308***	0.907***
Our organization is able to integrate databases of both firms (acquirer and target) after the acquisition(s)	4.582	0.357***	0.944***
Our organization is able to integrate business applications of both firms after the acquisition(s)	4.42	0.337***	0.938***
Our organization is able to integrate telecommunications of both firms after the acquisition(s)	2.79	0.379***	0.916***
IT personnel integration (mean = 3.24, standard deviation = 0.92)	3.985	0.418***	0.951***
IT personnel participate in the M&A planning process	1.862	0.204***	0.763***
IT personnel have prior IT integration experience	1.91	0.214***	0.762***
Our organization retains the IT and business talent of both firms that are at the core of the acquisition(s)	3.032	0.241***	0.839***
Our organization is able to integrate IT personnel skills of both firms after the acquisition(s)	4.815	0.267***	0.907***
IT personnel are able to identify and assimilate new technologies after the M&A	2.925	0.273***	0.869***
IT and business processes integration (mean = 3.197, standard deviation = 0.775)	3.245	0.35***	0.923***
Our organization is able to integrate IT and M&A management's experience of both firms	4.304	0.227***	0.906***
Our organization is able to integrate IT planning with organizational planning of both firms	4.358	0.227***	0.896***
Our firm provides corporate-wide information accessibility to all people during and/or after the M&A process	2.502	0.219***	0.841***
Our organization is able to integrate IT strategy of both firms with M&A strategy	3.645	0.236***	0.903***
Our organization is able to integrate IT with business capabilities of both firms after the acquisition(s)	2.702	0.226***	0.857***
Post-M&A performance (mean = 3.324, standard deviation = 0.798)**:** Since the acquisition(s), how the following issues have changed? (1 = Significant decline, 5 = Significant increase)	**VIF**	**Weight**	**Loading**
Sales	2.592	0.223*	0.816***
Intrinsic profitability (profit/capital employed)	3.371	0.151	0.79***
Earnings per share	3.423	0.277***	0.803***
Cash flow	4.237	0.168†	0.789***
Overall performance	1.21	0.469**	0.733***

Table A2. Correlation between Individual Post-M&A Performance Indicators and RSE

Post-M&A Performance Indicator	RSE 2007	RSE 2008	RSE 2009	RSE 2010	RSE 2011	RSE 2007–2011	RSE 2008–2011	RSE 2009–2011
1. Sales	0.828**	0.766***	0.674**	0.811***	0.784***	0.879**	0.831**	0.813**
2. Intrinsic profitability	-0.029	-0.134	-0.061	0.04	-0.035	-0.059	-0.067	-0.052
3. Earnings per share	0.066	0.3†	0.538**	0.275†	0.556**	0.54†	0.599*	0.609*
4. Cash flow	-0.022	-0.067	-0.467*	-0.221	-0.319*	-0.361†	-0.403†	-0.431*
5. Overall performance	0.065	0.057	0.059	0.043	0.073	0.075	0.075	0.074

Table A3. Results of the Confirmatory Composite Analyses

	First-Order Constructs			Instrumental and Control Variables			Second-Order Constructs		
Discrepancy	Value	HI_{95}	Conclusion	Value	HI_{95}	Conclusion	Value	HI_{95}	Conclusion
SRMR	0.074	0.14	Supported	0.075	0.11	Supported	0.047	0.058	Supported
d_{LS}	6.872	24.344	Supported	2.299	4.921	Supported	0.171	0.258	Supported
d_G	5.193	12.891	Supported	1.209	3.011	Supported	0.169	0.203	Supported

Table A4. Correlations of the Constructs at Second- and First-Order Levels

Construct	1	1.1	1.2	1.3	1.4	2	2.1	2.2	2.3	3	3.1	3.2	3.3	4	5
1. IT infrastructure flexibility	1														
1.1. IT compatibility	0.77	1													
1.2. IT connectivity	0.829	0.594	1												
1.3. Modularity	0.853	0.57	0.578	1											
1.4. IT personnel skills flexibility	0.768	0.39	0.486	0.572	1										
2. Business flexibility	0.531	0.345	0.419	0.441	0.48	1									
2.1. Operational flexibility	0.332	0.135	0.253	0.343	0.346	0.663	1								
2.2. Structural flexibility	0.421	0.352	0.326	0.325	0.372	0.79	0.358	1							
2.3. Strategic flexibility	0.43	0.276	0.376	0.361	0.394	0.805	0.319	0.402	1						
3. Post-M&A IT integration capability	0.637	0.458	0.534	0.553	0.476	0.413	0.218	0.327	0.363	1					
3.1. IT technical infrastructure integration	0.466	0.331	0.396	0.446	0.323	0.28	0.142	0.222	0.254	0.907	1				
3.2. IT personnel integration	0.685	0.507	0.597	0.593	0.525	0.406	0.196	0.321	0.389	0.951	0.804	1			
3.3. IT and business processes integration	0.572	0.426	0.474	0.497	0.462	0.438	0.273	0.358	0.363	0.923	0.749	0.821	1		
4. M&A activities	0.147	0.098	0.165	0.215	0.055	0.239	0.037	0.138	0.158	0.214	0.252	0.232	0.18	1	
5. Post-M&A performance	0.255	0.212	0.233	0.158	0.164	0.214	0.078	0.142	0.226	0.262	0.204	0.228	0.227	0.245	1

Correlations that are equal or higher than 0.135, 0.18, 0.245 and 0.325 are significant at 0.10, 0.05, 0.01 and 0.001 levels respectively.

Table A5. Results of the Sample Selection Bias and Halo Effects Analyses

Dependent variable		Standardized Path Coefficient	
Independent Variable	Hypothesis	Value	Significance
Business flexibility			
IT infrastructure flexibility	H1a	0.573	***
Business process outsourcing		0.154	*
IT infrastructure flexibility			
Business flexibility		0.088	n.s.
Data standards		0.381	***
Network standards		0.276	***
Object-oriented methodology		0.387	***
Shared knowledge		0.357	***
M&A activities			
Business flexibility	H1b	0.204	*
IT infrastructure flexibility		-0.087	n.s.
Acquirer's availability of cash		0.172	*
Acquirer size		0.387	***
Post-M&A IT integration capability			
IT infrastructure flexibility	H2a	0.583	***
Business flexibility	H2b	-0.149	n.s.
Prior IT integration experience		0.368	***
Post-M&A performance			
Post-M&A IT integration capability	H3	0.703	*
IT infrastructure flexibility		-0.224	n.s.
Pre-M&A technological relatedness		0.265	**
Acquirer's diversification		0.259	*
Acquirer size		0.264	*
Acquirer industry		0.078	n.s.
Prior M&A experience		0.007	n.s.
Method of payment		-0.016	n.s.
Relative target size		-0.24	*
IT investment		0.061	n.s.
Pre-M&A performance		0	n.s.

*p < 0.05; **p < 0.01; ***p < 0.001 (one-tailed test)

Appendix B

Technical Detail on SEM and PLS Path Modeling, and Endogeneity

Endogeneity means that a central assumption of multiple regressions, the uncorrelatedness of the error term with the independent variables, is not met. Models containing endogeneity are called non-recursive models (Cortina 2005). There is a long history of estimating nonrecursive models by means of SEM, and PLS path modeling can also be extended to cope with non-recursive models (Dijkstra and Henseler 2015). The sometimes used term "causal modeling" stems from the notion that SEM is indeed able to uncover the direction of effects (if certain assumptions are met). Wong and Law (1999) describe in detail how structural equation models should be specified in order to cope with endogeneity.

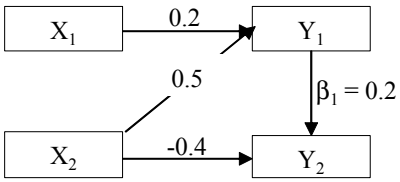
In this appendix, we demonstrate that a correct specification of a structural equation model allows retrieving unbiased estimates. In particular, two conditions must be met:

(1) There must be sufficient exogenous variables in the system of equations; specifically, the number of independent variables in each regression equation must not exceed the number of exogenous variables in the model. Instrumental variables are additional exogenous variables that help fulfill this condition.

(2) Residual correlations must be allowed to be different from zero.

We present the two major instances of endogeneity, namely omitted variables and feedback loops (i.e., models in which a variable has an indirect effect on itself), and show that if the two conditions are met, it is possible to retrieve the correct parameter values.

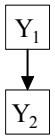
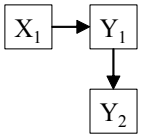
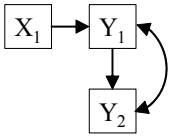
The first important case of endogeneity is from omitted variables. Omitted variables are a source of endogeneity if a common antecedent of variables is not included in a model (for instance, because it has not been measured). In order to show that SEM is indeed able to uncover the true parameters if the two conditions are met, we consider an example, in which the world functions according to the following model:



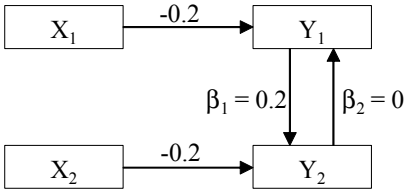
This model implies the following correlation matrix:

	X_1	X_2	Y_1	Y_2
X_1	1			
X_2	0	1		
Y_1	0.2	0.5	1	
Y_2	0.04	-0.3	0	1

Unfortunately, the researcher does not have data for X_2 available, and thus only a reduced correlation matrix without the second row/column is at hand. This reduced correlation matrix is analyzed using different model specifications: a simple regression of Y_2 on Y_1, a system of equations with uncorrelated error terms, and a system of equations with correlated error terms. The estimation results are listed below:

Parameter	True value	Estimates obtained for different model specifications		
		Simple regression 	System of equations with uncorrelated error terms 	System of equations with correlated error terms 
β_1	0.2	0	0	0.2

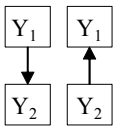
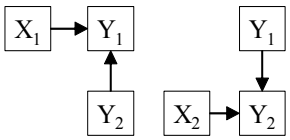
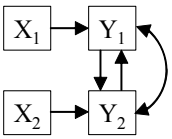
A second important case of endogeneity is that of models with feedback loops as for instance encountered in bidirectional relationships. In our paper, the relationship between the constructs IT infrastructure flexibility and business flexibility is bidirectional (i.e., it contains a feedback loop). In order to show that SEM is indeed able to uncover the true parameters if the two conditions are met, we consider another example. Let us assume that the world functioned according to the following model:



This model implies the following correlation matrix:

	X_1	X_2	Y_1	Y_2
X_1	1			
X_2	0	1		
Y_1	-0.2	0	1	
Y_2	-0.04	-0.2	0.2	1

This correlation matrix is analyzed using different model specifications. The estimation results are listed below:

Parameter	True value	Estimates obtained for different model specifications		
		Two separate simple regressions 	Two separate multiple regressions 	System of equations with correlated error terms 
β_1	0.2	0.2	0.192	0.2
β_2	0	0.2	0.2	0

As this example illustrates, a structural equation model with correlated error terms and instrumental variables is able to correctly uncover the true population parameters, whereas two separate models are not.

Appendix C

Details of Construct Measurement Specification

Table C1. Detailed Assessment of the Epistemic Relationship between First-Order Constructs and Indicators

Decision Rule/First-Order Construct	IT Compatibility	IT Connectivity	Modularity	IT Personnel Skills Flexibility	Operational Flexibility	Structural Flexibility
(1) Direction of causality from construct to indicator/item implied by the conceptual definition:	Item → Construct (compatible applications → IT compatibility)	Item → Construct (electronic channels → IT connectivity)	Item → Construct (reusable modules → Modularity)	Item → Construct (proactive IT personnel → IT personnel skills flexibility)	Item → Construct (operational repertoire → Operational flexibility)	Item → Construct (empowerment → Structural flexibility)
• Are the indicators (a) defining characteristics or (b) manifestations of the constructs?	Characteristics (multiple interfaces)	Characteristics (use of wireless devices)	Characteristics (modular)	Characteristics (proactive IT personnel)	Characteristics (quick-response operational routines)	Characteristics (job enlargement)
• Would changes in the indicators cause changes in the construct or not?	Yes (compatible applications)	Yes (electronic links with business partners)	Yes (communication in different protocols)	Yes (knowing key business success factors)	Yes (working with multiple suppliers)	Yes (using self-managed teams)
• Would changes in the construct cause changes in the indicators?	No	No	No	No	No	No
(2) Interchangeability of the indicators:	No	No	No	No	No	No
• Should the indicators have the same or similar content?	No (compatible applications and multiple interfaces)	No (external and internal electronic channels)	No (multiple protocols and reusable modules)	No (working in cross-functional teams and interpreting business problems)	No (using temporary personnel and extensive operational repertoire)	No (empowerment and job enlargement)
• Do the indicators share a common theme?	No	No	No	No	No	No
• Would dropping one of the indicators alter the conceptual domain of the construct?	Yes (dropping compatible applications)	Yes (dropping external electronic channels)	Yes (dropping reusable software modules)	Yes (dropping working in cross-functional teams)	Yes (dropping using of temporary personnel)	Yes (dropping empowerment)
(3) Covariation among the indicators: Should a change in one of the indicators be associated with changes in the other indicators?	Not necessarily (compatible applications and multiple interfaces)	Not necessarily (between external and internal electronic channels)	Not necessarily (between number of protocols and reusable modules)	Not necessarily (between working in cross-functional teams and self-organization)	Not necessarily (between working with multiple suppliers and crash teams)	Not necessarily (between empowerment and training)
Overall conclusion:	Formative	Formative	Formative	Formative	Formative	Formative

Table C1. Detailed Assessment of the Epistemic Relationship between First-Order Constructs and Indicators (Continued)

Decision Rule/First-Order Construct	Strategic Flexibilty	IT Technical Infrastructure Integration	IT Personnel Integration	IT Business Process Integration	Post-M&A Performance
(1) Direction of causality from construct to indicator/item implied by the conceptual definition:	Item → Construct (variety of products → Strategic flex.)	Item → Construct (databases integration → IT technical infrastructure integration)	Item → Construct (IT talent integration → IT personnel integration)	Item → Construct (IT and business plan integration → IT and business processes integr.)	Item → Construct (sales → Post-M&A performance)
• Are the indicators (a) defining characteristics or (b) manifestations of the constructs?	Characteristics (product market combination)	Characteristics (applications integration)	Characteristics (IT skills integration)	Characteristics (IT and business capabilities integration)	Characteristics (sales)
• Would changes in the indicators cause changes in the construct or not?	Yes (adoption of new technologies)	Yes (databases integration)	Yes (participation in M&A planning process)	Yes (IT and M&A strategy integration)	Yes (profitability)
• Would changes in the construct cause changes in the indicators?	No	No	No	No	No
(2) Interchangeability of the indicators:	No	No	No	No	No
• Should the indicators have the same or similar content?	No (variety of products and changing strategies)	No (databases and telecommunications integration)	No (M&A planning IT integration experience)	No (inf. accessibility and, IT and M&A strategy integration)	No (sales and earnings per share)
• Do the indicators share a common theme?	No	No	No	No	No
• Would dropping one of the indicators alter the conceptual domain of the construct?	Yes (adoption of new technologies)	Yes (databases integration)	Yes (retaining IT and business talent)	Yes (IT and business capabilities integration)	Yes (profitability)
(3) Covariation among the indicators: Should a change in one of the indicators be associated with changes in the other indicators?	No (covariation between changing strategies and advertising)	Not necessarily (covariation between integration of databases and telecommunications)	Mostly no (covariation between M&A planning and IT skills integration)	No (covariation between inf. accessibility and, IT and M&A strategy integration)	No (covariation between sales and earnings per share)
Overall conclusion:	Formative	Formative	Formative	Formative	Formative

Table C2. Detailed Assessment of the Epistemic Relationship between Second- and First-Order Constructs

Criteria/Second-Order Construct	IT Infrastructure Flexibility	Business Flexibility	IT Integration Capability
(1) Direction of causality from second- to first-order/dimension construct implied by the conceptual definition:	Dimension → Second-order construct (IT compatibility → IT infrastructure flexibility)	Dimension → Second-order construct (operational flexibility → Business flexibility)	Dimension → Second-order construct (IT personnel integration → IT integration capability)
• Are the dimensions (a) defining characteristics or (b) manifestations of the second-order constructs?	Characteristics (modularity)	Characteristics (structural flexibility)	Characteristics (IT and business processes integration)
• Would changes in the dimensions cause changes in the construct or not?	Yes (IT personnel skills flexibility)	Yes (strategic flexibility)	Yes (IT technical infrastructure integration)
• Would changes in the second-order construct cause changes in the dimensions?	No	No	No
(2) Interchangeability of the dimensions:	No	No	No
• Should the dimensions have the same or similar content?	No (IT connectivity and modularity)	No (operational and strategic flexibility)	No (IT technical infrastructure and IT personnel integration)
• Do the dimensions share a common theme?	No	No	No
• Would dropping one of the dimensions alter the conceptual domain of the second-order construct?	Yes (dropping IT personnel skills flexibility)	Yes (dropping operational flexibility)	Yes (dropping IT technical infrastructure integration)
(3) Covariation among the dimensions: Should a change in one of the dimensions be associated with changes in the other dimensions?	Not necessarily (covariation between IT compatibility and modularity)	No (covariation between structural and strategic flexibility)	No (covariation between IT technical infrastructure, and IT and business processes integration)
Overall conclusion:	Formative	Formative	Formative

Table C3. Descriptive Statistics for the Instrumental and Control Variables

Variable	Mean	Standard Deviation
Business process outsourcing	4.167	0.949
Data standards	3.788	1.001
Network standards	3.22	1.292
Object-oriented methodology	3.67	1.101
Shared knowledge	3.806	0.84
Acquirer's availability of cash	4.572	12.435
Acquirer size	4.625	1.755
Prior IT integration experience	2.23	1.37
Pre-M&A technological relatedness	3.132	1.266
Acquirer's diversification	0.266	0.391
Prior M&A experience	1.962	1.245
Method of payment	0.867	0.324
Relative target size	0.887	1.218
IT investment	2.72	0.975

Table C4. Cross-Loadings of the Constructs

	Construct										
Indicator	**ITCOM**	**ITCON**	**MOD**	**ITPSF**	**OPF**	**STRF**	**STRAF**	**ITTII**	**ITPI**	**ITBPI**	**PMAP**
ITCOM1	**0.663**	0.354	0.409	0.22	0.106	0.168	0.125	0.271	0.315	0.244	0.113
ITCOM2	**0.81**	0.45	0.369	0.208	0.12	0.347	0.152	0.188	0.335	0.276	0.144
ITCOM3	**0.849**	0.592	0.523	0.371	0.075	0.37	0.294	0.331	0.521	0.448	0.294
ITCOM4	**0.755**	0.389	0.438	0.375	0.133	0.163	0.243	0.21	0.344	0.3	0.048
ITCON1	0.405	**0.517**	0.156	0.204	0.11	0.366	0.319	0.057	0.212	0.157	0.034
ITCON2	0.513	**0.79**	0.39	0.324	0.111	0.231	0.194	0.267	0.434	0.398	0.204
ITCON3	0.531	**0.834**	0.523	0.422	0.237	0.296	0.312	0.366	0.538	0.438	0.242
ITCON4	0.287	**0.723**	0.517	0.418	0.25	0.115	0.299	0.374	0.475	0.32	0.144
MOD1	0.349	0.35	**0.704**	0.437	0.24	0.216	0.304	0.236	0.41	0.372	0.062
MOD2	0.4	0.466	**0.794**	0.49	0.252	0.222	0.175	0.422	0.466	0.349	0.126
MOD3	0.475	0.449	**0.829**	0.395	0.268	0.302	0.305	0.385	0.444	0.396	0.21
MOD4	0.47	0.451	**0.645**	0.387	0.264	0.226	0.299	0.272	0.447	0.367	0.059
ITPSF1	0.248	0.386	0.465	**0.76**	0.289	0.248	0.254	0.313	0.408	0.359	0.18
ITPSF2	0.3	0.309	0.356	**0.72**	0.241	0.208	0.2	0.184	0.368	0.296	0.135
ITPSF3	0.304	0.417	0.446	**0.738**	0.196	0.316	0.363	0.301	0.452	0.423	0.14
ITPSF4	0.313	0.321	0.427	**0.762**	0.313	0.327	0.34	0.143	0.323	0.28	0.026
OPF1	-0.057	0.1	0.204	0.108	**0.64**	0.085	0.217	0.104	0.12	0.122	0.153
OPF2	0.165	0.259	0.327	0.283	**0.874**	0.331	0.307	0.143	0.167	0.308	0.051
OPF3	0.019	0.059	0.165	0.283	**0.577**	0.228	0.083	0.1	0.118	0.159	-0.018
OPF4	0.163	0.238	0.258	0.292	**0.753**	0.315	0.265	0.066	0.153	0.151	0.063
STRF1	0.126	0.116	0.156	0.126	0.257	**0.552**	0.262	0.126	0.177	0.204	0.053
STRF2	0.171	0.242	0.179	0.228	0.098	**0.461**	0.182	0.141	0.177	0.132	0.051
STRF3	0.294	0.319	0.216	0.298	0.221	**0.831**	0.303	0.202	0.276	0.367	0.072
STRF4	0.245	0.215	0.232	0.279	0.294	**0.785**	0.309	0.067	0.215	0.233	0.134
STRF5	0.248	0.103	0.247	0.217	0.258	**0.441**	0.196	0.168	0.149	0.142	0.138
STRAF1	0.174	0.127	0.19	0.236	0.177	0.196	**0.705**	0.175	0.238	0.273	0.203
STRAF2	0.231	0.371	0.261	0.365	0.29	0.308	**0.746**	0.175	0.348	0.324	0.153
STRAF3	0.216	0.308	0.434	0.353	0.366	0.205	**0.786**	0.24	0.291	0.275	0.043
STRAF4	0.204	0.199	0.158	0.15	0.038	0.238	**0.599**	0.124	0.214	0.235	0.188
STRAF5	0.167	0.294	0.208	0.26	0.198	0.484	**0.754**	0.188	0.286	0.197	0.263
ITTII1	0.301	0.402	0.411	0.29	0.096	0.181	0.251	**0.944**	0.767	0.672	0.194
ITTII2	0.286	0.333	0.404	0.264	0.178	0.15	0.204	**0.938**	0.728	0.649	0.207
ITTII3	0.336	0.371	0.432	0.345	0.126	0.282	0.253	**0.916**	0.751	0.768	0.171
ITPI1	0.31	0.406	0.373	0.337	0.127	0.202	0.297	0.648	**0.763**	0.603	0.097
ITPI2	0.431	0.515	0.505	0.4	0.197	0.226	0.222	0.581	**0.762**	0.493	0.142
ITPI3	0.442	0.558	0.518	0.511	0.131	0.288	0.341	0.535	**0.839**	0.676	0.182
ITPI4	0.433	0.49	0.51	0.481	0.126	0.313	0.383	0.74	**0.907**	0.829	0.207
ITPI5	0.474	0.506	0.541	0.436	0.232	0.289	0.355	0.809	**0.869**	0.764	0.29
ITBPI1	0.375	0.407	0.429	0.418	0.227	0.28	0.284	0.681	0.767	**0.906**	0.138
ITBPI2	0.392	0.448	0.48	0.374	0.286	0.314	0.336	0.648	0.707	**0.896**	0.154
ITBPI3	0.303	0.369	0.424	0.439	0.306	0.372	0.337	0.603	0.673	**0.841**	0.183
ITBPI4	0.409	0.415	0.422	0.404	0.198	0.358	0.346	0.704	0.736	**0.903**	0.298
ITBPI5	0.395	0.446	0.435	0.399	0.188	0.253	0.295	0.66	0.732	**0.857**	0.221
PMAP1	0.116	0.099	0.063	0.085	0.085	-0.023	0.203	0.101	0.087	0.136	**0.816**
PMAP2	0.149	0.108	0.081	0.039	0.031	0.065	0.148	0.031	-0.02	0.033	**0.79**
PMAP3	0.161	0.132	0.101	0.133	0.089	0.158	0.157	0.118	0.103	0.179	**0.803**
PMAP4	0.193	0.04	0.047	0.093	0.012	0.161	0.069	0.069	0.013	0.096	**0.789**
PMAP5	0.186	0.323	0.205	0.185	0.059	0.142	0.22	0.282	0.386	0.268	0.733

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