Information Technology, and Exploration and Exploitation of Business Opportunities: An Empirical Investigation

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Abstract
Understanding how and why some firms are better than others at exploring and exploiting new business opportunities is a cutting-edge research problem. Our central thesis, that information technology (IT) performs a differential role in firms' opportunity exploration and exploitation, led us to examine how IT influences exploration and exploitation of business opportunities. We tested the proposed theory using partial least squares on a combination of survey and secondary data from 203 large firms in Spain. We found that: (1) IT infrastructure provides the foundation to build business experimentation, and the flexibility to sense and explore business opportunities; and (2) IT infrastructure-enabled business flexibility helps firms to develop the operational proficiency to exploit business opportunities, and increase their performance. This research contributes to the field of Information Systems by explaining whether and how IT infrastructure influences the firm's capabilities for opportunity exploration and exploitation. The managerial implications are also discussed.

Keywords
IT infrastructure, exploration and exploitation, business opportunities, business value of IT.

Introduction
Firms explore and exploit new business opportunities (i.e., entering a new market, forming an alliance, completing a merger) to increase their performance and survive in the long term. These actions are especially important in global and competitive environments, where emerging implementation of information technology (IT) can help to manage business opportunities (Benitez et al. 2016). For example, Dell successfully leverages innovative ideas provided by users through their IT-based platform Dell's IdeaStorm. Yet some firms sense, seize and/or exploit business opportunities better and faster than others, how and why is this the case? The answer to this question interests both IT and business scholars/managers. Although recent studies agree that firms can simultaneously explore and exploit organizational knowledge, understanding how firms both explore and exploit business opportunities is still emerging. More specifically, whether and how IT can enable firms to explore and exploit business opportunities remains unclear (Gregory et al. 2015). Our study seeks to address this gap in the literature on Information Systems (IS) by answering this research question: How IT enables firms to explore and exploit business opportunities? Our central thesis is that IT can perform a differential role in exploring and exploiting business opportunities in two ways: (1) IT can enable firms to explore new business opportunities by providing the firm with business flexibility (Benitez & Ray 2012) and building business experimentation (Swanson & Ramiller 2004); and (2) IT can facilitate firms' development of operational competence (Setia & Patel 2013) to exploit business opportunities and increase its performance. Zara (a
IT, Exploration and Exploitation of Business Opportunities

leading Spanish firm in the apparel industry) shows an organizational behavior based on these two rationales. Zara optimizes its IT resource infrastructure to sense and explore customer needs (business opportunities) before competitors do. Once the opportunity is sensed and explored, Zara responds rapidly by exploiting its excellent locations and gross margin control capabilities to convert the opportunity into business gains.

Exploration of business opportunities refers to the firm’s activities to seek and/or shape business opportunities within and/or throughout the firm (e.g., experimenting with new ideas and technologies). Exploratory behaviors involve experimenting and shaping new ideas (e.g., products or markets) to sense and shape new business opportunities (Kristal et al. 2010). Firms’ exploratory behaviors involve flexibility, experimentation, and the search for new ways to solve problems. These behaviors suggest that business flexibility and business experimentation being considered as two mechanisms through which firms can pursue exploration of business opportunities. Exploitation of business opportunities are firm’s operational activities to take advantage of the benefits of business opportunities (e.g., refinement, selection, and implementation of new organizational knowledge) (March 1991). Exploitative firm activities (e.g., searching for ways to improve and refine daily operations and operational processes) imply using existing operational capabilities to achieve lower costs, reliability, and efficiency in the operational domain (Kristal et al. 2010). We thus study exploitation of business opportunities by examining the relationship between the firm’s portfolio of operational capabilities and firm performance.

This study proposes a theory in which IT infrastructure capability: (1) provides the firm with business flexibility, business experimentation; and (2) develops the operational competence to increase firm performance. We thus examine three key mechanisms (business flexibility, business experimentation, and operational competence) through which IT infrastructure capability may influence exploration and exploitation of business opportunities. This research contributes to the field of IS by explaining whether and how IT infrastructure capability influences the firm’s capabilities to explore and exploit business opportunities. This is the first study to explain theoretically and present empirical evidence on business flexibility, business experimentation, and operational competence as three specific mechanisms and pathways through which IT infrastructure capability helps firms to explore and exploit business opportunities.

Theory and Hypotheses

Exploration and Exploitation of Business Opportunities

Study of IT impact on exploration and exploitation of business opportunities has been very scarce to date. Although some prior studies provide some evidence about organizational ambidexterity and the role of IT (e.g., Gregory et al. 2015; Im & Rai 2014; Lee et al. 2015), it remains unclear how IT infrastructure capability can lead to explore and exploit new business opportunities. Prior IS research has not paid much attention to this key research topic. Based on the Organizational Learning literature, some studies have explored the role of IT on different learning strategies (exploration, exploitation). For example, Park et al. (2015) explore the impact of different IT mechanisms and the learning strategies of exploration and exploitation on knowledge outcomes in an inter-organizational setting. They find that if the firm has an ambidexterity strategy, the best knowledge outcomes are achieved when using electronic communication networks.

Among prior IS research on the role of IT in exploring and exploiting opportunities, Subramani (2004) studies the effect of the exploration and exploitation use of supply chain management systems to create value. Im and Rai (2014) develop the concept of contextual ambidexterity (i.e., throughout the supply chain), and explore the IT effect on contextual ambidexterity. Gregory et al. (2015) focus on the ambidexterity theory to explain managerial troubleshooting in transforming IT programs. They identify six ambidexterity areas to resolve to ensure success in IT transformation programs. Lee et al. (2015) analyze the impact of IT ambidexterity on organizational agility. They find that the dual capability to explore and exploit IT resources and practices enhances the firm’s organizational agility through the mediating effect of operational ambidexterity. We adopt a different approach, examining three specific mechanisms (business flexibility, business experimentation, and operational competence) enabled by IT infrastructure capability through which large firms explore and exploit business opportunities in the Spanish business community.
IT Infrastructure Capability, Business Flexibility, and Business Experimentation

IT infrastructure refers to the firm’s set of shared technological, managerial, and technical IT resources that provide the basis for using multiple IT applications (Melville et al. 2004). Technological IT resources include servers, computers, laptops, operating systems, and electronic communication networks (Aral & Weill 2007). Managerial IT resources refer to IT managers’ (IT and business) skills in identifying and supporting IT-enabled business activities, approving IT innovation projects, deploying a portfolio of resources, searching for new business opportunities, and working effectively with business managers to execute the firm’s business strategies (Benitez & Ray 2012). Technical IT resources are IT personnel’s (IT and business) skills in designing databases, developing new IT applications, improving the efficiency of IT services, and using different programming languages (Ray et al. 2005). IT infrastructure capability indicates the firm’s ability to purposely leverage its IT resources to acquire/provide accurate, timely, and reliable information from/to key users (Mithas et al. 2011). Draw from Melville et al. (2004), IT infrastructure capability is a second-order capability determined by technological, managerial, and technical IT resource infrastructure capabilities.

Business flexibility is the firm’s ability to sense and seize business opportunities, and better reconfigure or reallocate operational processes, resources, and strategies to deal with environmental changes for competitive action (Benitez & Ray 2012). Business flexibility is a second-order concept determined by operational, structural, and strategic flexibility (Volberda 1996). Operational flexibility is the firm’s ability to sense and seize business opportunities by changing operational processes. Structural flexibility refers to the firm’s ability to sense and seize business opportunities by changing organizational structure, and decision and communication processes. Strategic flexibility is the firm’s ability to sense and seize business opportunities by changing strategies and competitive actions (Chen et al. forthcoming). Business experimentation refers to the firm’s ability to shape shared organizational values that encourage experimentation, creativity, and innovation among organization’s members (Chandler et al. 2000). It exhibits the culture and managerial attitude in supporting changes and innovative behaviors, giving employees power and freedom to experiment and try new concepts and projects (Takeuchi et al. 2008).

IT infrastructure capability can affect business flexibility, both directly and indirectly through business experimentation. IT infrastructure capability can influence operational, structural, and strategic flexibility, thus enabling business flexibility. This capability enables firms to share information throughout the supply chain and facilitates real-time collaboration with partners to increase operational flexibility (Devaraj et al. 2007). IT infrastructure capability can also enable managers to provide employees with real-time information, and thus to decentralize decision rights and empower employees to make timely and informed decisions, increasing structural flexibility. Further, IT infrastructure facilitates cross-functional virtual teams that enable rapid reconfiguration of organizational structures. The ability to leverage IT infrastructure enables firms to capture and share real-time information from the business environment (e.g., customer data) (Dai et al. 2015), and thus to sense new opportunities and respond with/to competitive actions (e.g., developing new products, entering new markets, forming an alliance) by changing their strategy, thereby increasing the firms’ strategic flexibility (Benitez & Ray 2012). We thus hypothesize:

H1a: There is a positive relationship between IT infrastructure capability and business flexibility.

IT infrastructure capability can also affect business flexibility by facilitating business experimentation. A firm’s ability to leverage IT resource infrastructure can facilitate business experimentation. Firms that use primarily IT-based management systems are better able to explore innovative solutions (Kleis et al. 2014). Technological IT resource infrastructure enables firms to provide their managers and employees with accurate real-time information and thus to learn and experiment with new product concepts and/or business processes improvements (Gao et al. 2015). Similarly, IT managers’ and employees’ (IT and business) skills can enable firms to innovate and reconfigure the firm’s IT resource base (i.e., IT application development) to ensure experimentation and learning culture in the long term. We therefore hypothesize the following:

H1b: There is a positive relationship between IT infrastructure capability and business experimentation.

The firm’s ability to shape organizational shared values to encourage experimentation, innovation, and creativity can help firms to achieve business flexibility. Building a firm’s ability to allow for failure fosters the ability to generate solutions for unsolved problems in operational and decision-making processes,
increasing operational and structural flexibility (Chandler et al. 2000). For instance, the capability of business experimentation on Bosh India promotes the faster development of innovations capable of fulfilling changing customer demands and regulatory requirements. Toyota’s employees, who work in a constantly challenge environment, feel free and empowered to expose their opinions and generate innovative ideas to pull ahead competitors and solve problems in an agile way. Business experimentation can also encourage organization’s members to use business analytics and recommend new product concepts and markets, making it easier for the firm to change its strategies, increasing the firm’s strategic flexibility (Kristal et al. 2010). We thus hypothesize that:

H1c: There is a positive relationship between business experimentation and business flexibility.

**Business Flexibility, Operational Competence, and Firm Performance**

Operational competence refers to the firm’s ability to exploit its portfolio of operational capabilities. Operational capabilities are the firm’s ability to use a set of operational activities to solve operational problems and achieve superior firm performance. Drawn from the work of Tatikonda et al. (2013), this study focuses on two key operational capabilities: operational excellence and gross margin management. Operational excellence refers to the firm’s ability to develop and execute operations routines to manufacture products and supply them to the market with agility (Kortmann et al. 2014). Gross margin management is the firm’s ability to manage proper product margins (Tatikonda et al. 2013). We assess firm performance in financial terms.

We argue that IT infrastructure can facilitate development of operational competence to increase firm performance through business flexibility. Once a firm has sensed and explored an opportunity, it needs to develop the operational competence to seize and exploit that opportunity by taking advantage of its business benefits. Flexible firms can adapt their operational and communication processes, as well as their operations strategy to develop/improve operational routines quickly to pursue operational excellence (Rindova & Kotha 2001). Ford’s rigidity hindered its transition to new production process design, making the firm unable to respond to market changes to preserve first-mover advantage and giving more flexible firms like General Motors an opportunity to lead the market. Estimating/managing successful margins for new products/markets requires time, experience, and collaboration throughout the supply chain. Because flexible firms sense, seize, and assimilate new product opportunities before competitors do (Benitez & Ray 2012), they can take advantage of having more time and experience to manage new product margins, and ultimately prompt development of the gross margin management capability (Kortmann et al. 2014). We therefore hypothesize:

H2a: There is a positive relationship between business flexibility and operational competence.

Operational competence can increase financial performance, enabling firms to exploit business opportunities. Better execution of operational routines and proficiency in managing product margins can save costs and increase revenues, which in turn increases the firm’s financial performance (Tatikonda et al. 2013). Such is the case of Privalia, an online fashion outlet firm that has based its competitive advantage on the operational efficiency of its production department by performing operations as quickly as possible to match production and sales, while ensuring both quality and service margin control. We thus hypothesize:

H2b: There is a positive relationship between operational competence and firm performance.

**Research Methodology**

**Sample and Data**

We test the proposed theory with survey and secondary data for a sample of 203 large firms in Spain drawn from a list of the 1046 most admired firms in Spain in the 2007 Actualidad Economica database (http://www.actualidaddeconomica.com/). Actualidad Economica annually designs, publishes, and sells several databases that compile public information on sales, innovation effort, employer brand value, and executive compensation for the most admired firms in Spain. We carefully designed a questionnaire by adapting scales from prior research. The questionnaire and a cover letter were mailed to senior IT/business executives in the 1046 firms on the list mentioned above. We received 203 valid
questionnaires from December 2007 to April 2008, giving a response rate of 20.24%. The firms belong to 25 industries: 39 firms (19.212%) operated in the wholesale industry, 35 (17.241%) in real estate and/or construction, 15 (7.389%) in communications and graphic design, 15 in the chemical industry (7.389%), 12 (5.911%) in the retail sector, 10 (4.926%) in non-metal mining, 9 (4.433%) in consulting services, 8 (3.941%) in food, drink, and tobacco, and the rest (60 firms, 29.558%) in other industries. On average, the sample firms’ total revenues in 2007 were 1050.691 million Euros, and they had about 2401 employees. Our study combines survey and secondary data to measure exogenous and endogenous variables, an approach that minimizes the problem of common method bias. We operationalize all constructs as composite at first- and second-order level.

![Figure 1. Conceptual Model](image)

**Measures**

IT infrastructure capability is a second-order construct determined by technological, managerial, and technical IT infrastructure capabilities. We measured technological IT infrastructure capability through annual investment in technological IT resource infrastructure per employee (Ray et al. 2005). We measured managerial and technical IT infrastructure capabilities by adapting the scales from Byrd and Davidson (2003), and Ray et al. (2005). Business flexibility is a second-order construct determined by operational, structural, and strategic flexibility (Benitez & Ray 2012). We measured operational, structural, and strategic flexibility by creating a scale based on Volberda (1996). Business experimentation is specified as a first-order construct, using a scale adapted from Chandler et al. (2000).

We measured operational competence through operational excellence and gross margin management (Tatikonda et al. 2013). Operational excellence was measured by the average rate of operational sectoral excellence (RSE) for the period 2007-2011, using information gathered from Actualidad Economica database. The RSE, an objective measure of firms’ sectoral excellence in sales (Benitez et al. 2015), can be estimated from secondary data contained in any known sales ranking of firms in the following way: RSE = 1 - (Sales ranking position of firm / Total number of firms in the industry). We measured gross margin management through the average gross margin for the period 2007-2011 using information collected from the SABI database (Tatikonda et al. 2013). Firm performance was measured through the average firm return on assets for the period 2007-2011 using information also collected from the SABI database. This study controlled for the effect of quality management on business experimentation, operational competence, and firm performance. We also controlled for firm size and industry on operational competence and firm performance. Quality management was measured with a scale of two indicators adopted from Zhu and Sarkis (2004). We estimated firm size as the natural logarithm of the average number of employees for the period 2007-2011 using information collected from Actualidad Economica database. Industry was measured as a dummy variable (0: Manufacturing, 1: Service firm).
Empirical Analysis

We performed a partial least squares (PLS) path modeling to test the hypotheses and examine the mediation effects proposed in the model. This estimation method is appropriate for the following reasons: (1) PLS can test for exact model fit, and provides consistent estimations (Henseler et al. 2014); (2) and is an optimal method to estimate composite models (Henseler et al. 2014). We use the statistical software package Advanced Analysis for Composites (ADANCO 2.0.0 Professional for Windows (http://www.composite-modeling.com/)) (Henseler & Dijkstra 2015).

Measurement Model Evaluation

We evaluated whether the indicators of all first-order constructs and the dimensions of second-order constructs contained the full domain of the construct. Evaluation ensured the content validity of all constructs included in our study, where possible, using scales previously validated in prior research. We pre-tested the questionnaire with 15 faculty members, performed a pilot test with eight top executives, and made a Q-sorting test with six Ph.D. students. We also checked the validity of our structures of composite by performing a confirmatory composite analysis (Henseler et al. 2014). We also checked for multi-collinearity, weights, loadings, and significance level of the composite first- and second-order constructs. We tested for multi-collinearity by checking whether the dimension and indicator variance inflation factors (VIFs) were lower than 10 (Petter et al. 2007). VIFs values ranged from 1.006 to 2.977 at first-order level, and range from 1.435 to 1.973 at second-order level, well below 10, suggesting that multi-collinearity is not a problem in our composite constructs. Composite indicator and dimension should be retained when its weight is significant or when its weight is not significant but loading it is. The analysis yielded two weights referring to indicators of operational flexibility and structural flexibility that were not significant. However, all first- and second-order loadings were significant at 0.001 level. Overall, the analysis suggests good properties for our composite measures.

Overall Model Fit Evaluation

As part of the confirmatory composite analysis we examined the standardized root mean squared residual (SRMR), unweighted least squares (ULS) discrepancy ($d_{ULS}$), and geodesic discrepancy ($d_{G}$) at first- and second-order level to evaluate the goodness of model fit of the structure of measures of the proposed model (Henseler et al. 2014). These measures of goodness of fit evaluate the discrepancy between the empirical correlation matrix and the model-implied correlation matrix. The lower they are, the better the fit of the saturated model (Henseler & Dijkstra 2015). All discrepancies were below the 95%-quantile of the bootstrap discrepancies at first- and second-order level. This analysis gives empirical support to the structure of our composites at first- and second-order level.

Test of Hypotheses

We examined the path coefficients, level of significance, and $f^2$ and $R^2$ values for testing the proposed model. The effect size ($f^2$) specifies the relative size of each incremental relationship included in the model. $f^2$ values lower than 0.020, higher than 0.150, and higher than 0.350 indicate, respectively, weak, medium, or large effect size of adding a link between an exogenous and endogenous variable. The $f^2$ values of the links involved in the hypothesized relationships ranged from 0.021 to 0.428. Table 2 shows the results of the test of hypotheses (i.e., base model and base model with direct effects). We found support for $H_{1a}$, $H_{1b}$, and $H_{1c}$ at 0.001, 0.001, and 0.05 levels respectively, suggesting that IT infrastructure capability influences business flexibility both directly and indirectly through business experimentation. The empirical analysis also provided support for $H_{2a}$ and $H_{2b}$ at 0.001 level, indicating that business flexibility facilitates the development of operational competence to increase firm performance. Of the control variables, quality management had a significant positive effect on business experimentation (0.001 level) and firm performance (0.05 level). Firm size had a significant positive effect on operational competence (0.001 level) and a negative effect on firm performance (0.05 level). Industry had a significant negative effect on operational competence (0.001 level) and firm performance (0.05 level).
Mediation Analysis

We conducted a mediation analysis to examine the indirect effects involved in the proposed model. We added a link to the proposed model between: (1) IT infrastructure capability and operational competence/firm performance, (2) business flexibility and firm performance, and (3) business experimentation and operational competence/firm performance. The effects of IT infrastructure capability on operational competence through business flexibility and business experimentation were significant. The effect of business experimentation on operational competence through business flexibility and the effect of business flexibility on firm performance through operational competence were significant (Zhao et al. 2010). This mediation analysis reinforced the results obtained in the test of hypotheses (see Table 1).

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Direct effect</th>
<th>Indirect effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT infrastructure capability → Business flexibility</td>
<td>0.328***</td>
<td>0.084*</td>
</tr>
<tr>
<td>IT infrastructure capability → Operational competence</td>
<td>-0.057</td>
<td>0.139***</td>
</tr>
<tr>
<td>IT infrastructure capability → Firm performance</td>
<td>-0.040</td>
<td>-0.032</td>
</tr>
<tr>
<td>Business experimentation → Operational competence</td>
<td>0.017</td>
<td>0.049</td>
</tr>
<tr>
<td>Business experimentation → Firm performance</td>
<td>-0.100</td>
<td>0.027</td>
</tr>
<tr>
<td>Business flexibility → Firm performance</td>
<td>-0.049</td>
<td>0.162***</td>
</tr>
</tbody>
</table>

Table 1. Mediation Analysis

Test of Robustness

Since it may be discussed that flexibility can support the firm in explorative innovation, we tested for the robustness of the proposed model by proving the alternative theory of reversing the direction of causality between business flexibility and business experimentation, and adding a link from business experimentation to operational competence. Starting from our base model without the direct effects, we tested this alternative argument estimating two alternative models: (1) in a first alternative structural model, business flexibility affects business experimentation; (2) in a second alternative structural model, we reversed the direction of causality between business flexibility and business experimentation and added a link from business experimentation to operational competence. This test showed that there is scarcely level of significance on the business flexibility to business experimentation direction of causality and no direct relationship is found between business experimentation and operational competence. In addition, the alternative structural models had higher discrepancy values (SRMR, $d_{ULS}$, and $d_G$) (Table 2), suggesting poorer goodness of fit. Overall, the test of robustness suggested that the proposed model provides the best and most rational explanation of the data (e.g., Braojos et al. 2015).

Discussion and Conclusions

Although firms need to explore and exploit new business opportunities to increase their performance and survive in the long term, our knowledge of how firms explore and exploit opportunities is still emerging. For example, we need to understand why some firms explore and exploit business opportunities better and faster than others. This study examines how IT infrastructure capability influences exploration and exploitation of business opportunities in a sample of 203 large firms in Spain. We found that: (1) IT infrastructure capability facilitates the development of business experimentation and the business flexibility capabilities to sense and explore business opportunities before competitors do, thus enabling exploration of opportunities; and (2) IT-enabled business flexibility helps firms to develop the operational proficiency to seize and exploit the sensed opportunities, thus facilitating to survive in the long run.

There is plenty of literature exploring how firms use IT in supporting organizational capabilities to obtain performance (e.g., Ravichandran et al. 2005). However, we base our study in the context of exploring and exploiting opportunities. Study of IT impact on the exploration and exploitation of business opportunities has been very scarce to date. We examined how IT infrastructure capability influences exploration and exploitation of business opportunities in large firms in the Spanish business community. Specifically, our study is the first to focus on the theoretical explanation and empirical examination of three specific causal mechanisms (business flexibility, business experimentation, and operational competence) through which IT infrastructure capability influences the firm’s capabilities for opportunity exploration and exploitation.
<table>
<thead>
<tr>
<th>Beta coefficient</th>
<th>Base model</th>
<th>Base model with direct effects</th>
<th>First alternative model</th>
<th>Second alternative model</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT infrastructure capability → Business flexibility (H1a)</td>
<td>0.327***</td>
<td>0.328***</td>
<td>0.414***</td>
<td>0.414***</td>
</tr>
<tr>
<td>IT infrastructure capability → Business experimentation (H1b)</td>
<td>0.538***</td>
<td>0.537***</td>
<td>0.502***</td>
<td>0.502***</td>
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<tr>
<td>Business experimentation → Business flexibility (H1c)</td>
<td>0.158*</td>
<td>0.157*</td>
<td></td>
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<tr>
<td>Business flexibility → Operational competence (H2a)</td>
<td>0.287***</td>
<td>0.315***</td>
<td>0.286***</td>
<td>0.295***</td>
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<tr>
<td>Operational competence → Firm performance (H2b)</td>
<td>0.499***</td>
<td>0.515***</td>
<td>0.499***</td>
<td>0.488***</td>
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<tr>
<td>IT infrastructure capability → Operational competence</td>
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<td>IT infrastructure capability → Firm performance</td>
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<td>Business experimentation → Firm performance</td>
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<tr>
<td>Business flexibility → Firm performance</td>
<td>-0.049</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business flexibility → Business experimentation</td>
<td>0.092*</td>
<td>0.092*</td>
<td></td>
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</tr>
<tr>
<td>Quality management → Business experimentation (control variable)</td>
<td>0.162***</td>
<td>0.162***</td>
<td>0.140**</td>
<td>0.140**</td>
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<tr>
<td>Quality management → Operational competence (control variable)</td>
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<td>-0.036</td>
<td>-0.038</td>
<td>-0.034</td>
</tr>
<tr>
<td>Quality management → Firm performance (control variable)</td>
<td>0.069</td>
<td>0.107*</td>
<td>0.069</td>
<td>0.068</td>
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<tr>
<td>Firm size → Operational competence (control variable)</td>
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<td>0.440***</td>
<td>0.450***</td>
<td>0.448***</td>
</tr>
<tr>
<td>Firm size → Firm performance (control variable)</td>
<td>-0.137*</td>
<td>-0.151*</td>
<td>-0.137*</td>
<td>-0.132*</td>
</tr>
<tr>
<td>Industry → Operational competence (control variable)</td>
<td>-0.202***</td>
<td>-0.196***</td>
<td>-0.202***</td>
<td>-0.202***</td>
</tr>
<tr>
<td>Industry → Firm performance (control variable)</td>
<td>-0.095*</td>
<td>-0.101*</td>
<td>-0.095*</td>
<td>-0.098*</td>
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<tr>
<td><strong>R²</strong></td>
<td>0.334</td>
<td>0.333</td>
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<td>Business experimentation</td>
<td>0.189</td>
<td>0.190</td>
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<td>0.172</td>
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<tr>
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<td>0.384</td>
<td>0.392</td>
<td>0.384</td>
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<td>Operational competence</td>
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<td>0.241</td>
<td>0.234</td>
<td>0.226</td>
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<tr>
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<td>0.201</td>
<td>0.245</td>
<td>0.200</td>
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<tr>
<td>dₑ value</td>
<td>0.464</td>
<td>0.465</td>
<td>0.468</td>
<td>0.470</td>
</tr>
<tr>
<td>dₑ HI₉₅</td>
<td>7.092</td>
<td>6.602</td>
<td>7.004</td>
<td>7.154</td>
</tr>
</tbody>
</table>

Table 2. Test of Hypotheses and Test of Robustness

This is the first key contribution of our study. We found support for the proposed theory. IT infrastructure capability provides the foundation to build business experimentation and business flexibility to sense and explore business opportunities, thus enabling exploration. IT-enabled business flexibility helps firms to develop the operational proficiency to exploit opportunities and increase their performance, thus enabling exploitation. The IS field is currently debating whether IT enables or hinders business flexibility. Most prior research argues that IT enables business flexibility. We found that IT infrastructure capability enables business flexibility to explore and exploit business opportunities. Our study also contributes to better understanding of the connection between several types of organizational capabilities (IT, dynamic, and operational capabilities), and the firm’s capabilities for opportunity exploration and exploitation. The results of our study imply that IT infrastructure is the foundational capability from which to develop organizational capabilities on a dynamic base (business flexibility and business experimentation), which in turn facilitates design of a portfolio of operational capabilities that directly increase firm performance. Several studies consider exploration and exploitation as causes or consequences (Kristal et al. 2010) of dynamic and operational capabilities. In contrast, we argue and demonstrate empirically that the mechanisms of business flexibility, business experimentation, and operational competence are neither cause nor consequence of opportunity exploration and exploitation, but rather the means of pursuing
opportunity explorative and exploitative activities of the firm. Business flexibility and business experimentation are the (dynamic) opportunity exploration capabilities, and operational competence is the (operational) opportunity exploitation capability. These results, which refine our knowledge of the impact of IT-enabled dynamic and operational capabilities, and of the firm’s opportunity exploration and exploitation capabilities, constitute the third key contribution of this study. IT can impact firms differently attending to several variables. Future research could point toward examining the moderating role of industry, firm size, and other environmental variables on this equation. Firms must sense, explore, and exploit business opportunities better and faster their competitors do to survive in the long term. This study also provides interesting and useful lessons on these issues for (IT and business) managers. Specifically, we demonstrated that IT infrastructure is a valuable capability to explore and exploit business opportunities. Leveraging the firm’s IT resource infrastructure is more important than the amount that the firm invests in that IT infrastructure to overcome the challenge of sensing opportunities. IT infrastructure can be leveraged to enable business experimentation and business flexibility and to sense and explore opportunities carefully, better and faster than competitors do. Sensing an opportunity in advance of competitors gives the firm more time and experience to explore and develop carefully the most appropriate/profitable operational proficiency in terms of operational excellence and product margin control. We thus also illustrated how the firm can leverage IT-enabled business flexibility to develop operational routines and control product margins, thereby converting opportunity into business gains.

Acknowledgments

This research was sponsored by the European Regional Development Fund (European Union) and the Government of Spain (Research Project ECO2013-47027-P), the Regional Government of Andalusia (Research Project P11-SEJ-7294), and the COVIRAN-Prodware Chair of Digital Human Resource Strategy at the School of Human Resource Management of the University of Granada.

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