INFORMATION TECHNOLOGY COMPETENCY AND ORGANIZATIONAL AGILITY: ROLES OF ABSORPTIVE CAPACITY AND INFORMATION INTENSITY

Hongyi Mao  
Jiujiang University, Jiujiang, Jiangxi, China, maojoey@gmail.com

Shan Liu  
Xi’an Jiaotong University, Xi’an, Shaanxi, China, shan.l.china@gmail.com

Jinlong Zhang  
Huazhong University of Science and Technology, Wuhan, Hubei, China, jlzhang@hust.edu.cn

Yajun Zhang  
Guizhou University of Finance & Economics, Guiyang, Guizhou, China, 496078104@qq.com

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INFORMATION TECHNOLOGY COMPETENCY AND ORGANIZATIONAL AGILITY: ROLES OF ABSORPTIVE CAPACITY AND INFORMATION INTENSITY

Research paper

Mao, Hongyi, Jiujiang University, Jiujiang, Jiangxi, China, maojoey@gmail.com
Liu, Shan, Xi'an Jiaotong University, Xi'an, Shaanxi, China, shan.l.china@gmail.com
Zhang, Jinlong, Huazhong University of Science and Technology, Wuhan, Hubei, China, jljzhang@hust.edu.cn
Zhang, Yajun, Guizhou University of Finance & Economics, Guiyang, Guizhou, China, 496078104@qq.com

Abstract

Organizational agility has become increasingly essential for contemporary organizations to survive and compete in this information age. Although scholars have discussed the possible effects of information technology (IT) competency on organizational agility, existing knowledge on IT-agility relationship is limited. An integration analysis of internal capability and external environment is lacking. This study investigates the mediating role of absorptive capacity and the moderating role of information intensity in IT-agility relationship to fill the research gap. Empirical evidence from the data of 165 organizations in China shows that the effects of absorptive capacity are multifaceted and nuanced. In particular, absorptive capability partially mediates the effects of IT knowledge and IT operations on market capitalizing agility and fully mediates their effects on operational adjustment agility. No mediations are found in IT objects. The results also show that information intensity strengthens the effects of IT operations and objects on absorptive capacity. We then discuss theoretical and practical implications.

Keywords: Information technology competency, Absorptive capacity, Market capitalizing agility, Operational adjustment agility, Information intensity.

1 Introduction

Organizational agility has become increasingly essential for contemporary organizations to survive and compete in this information age (Kappelman et al., 2014; Lu and Ramamurthy, 2011). The Pulse of the Profession Report in 2015 has indicated that the culture of agility could lead to significant benefits, including fast response to changing market conditions, efficient strategy execution, and profitable business results. Over the recent decade, the role of information technology (IT) in creating organizational agility has been a leading concern of both managers and scholars. Big companies, such as Zara and Dell, invest considerably in IT to achieve organizational agility by acquiring and analyzing real-time information on customer and market demand. In information system (IS) literature, the role of IT is complex in IT business value research (Melville et al., 2004), and scholars usually regarded IT as a kind of firm’s competency to effectively utilize IT resources to manage information throughout the organization (Mao et al., 2016; Tippins and Sohi, 2003). It seems that IT competency appears to strengthen organizational agility, but this role cannot always be observed. According to resource-based view (RBV), IT competency is a valuable, rare, and appropriable resource that enables rapid and flexi-
able business operations (Chen et al., 2014; Mao et al., 2015). However, some studies argue that IT competency can bring massive data and technology dependence, which hinders the agility of organizations (Allen and Boynton, 1991; Rettig, 2007; Van Oosterhout et al., 2006). Moreover, a mixed role of IT on organizational agility has also been discussed that IT could be both an enabler and a disabler for organizational agility (Overby et al., 2006; Seo and La Paz, 2008). Therefore, further investigations on the relationship between IT competency and organizational agility are needed.

Apart from RBV, information system (IS) scholars have focused on knowledge-based theory (KBV) and suggested that the ability of the organization to manage knowledge can result in innovation, flexibility, and performance (Liu et al., 2013; Roberts et al., 2012). In IS literature, absorptive capacity is a knowledge-based capability leading to great business value (Roberts et al., 2012), and is often viewed as “a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability” (Zahra and George, 2002, p. 186). Developing absorptive capacity is treated as a significant approach to deliver IT-enabled changes (Cooper and Molla, 2016). Considering that scholars have adopted dynamic capabilities theory as reference framework in identifying the role of organizational agility (Felipe et al., 2016), the concept of absorptive capacity has been used to understand the organizational ability to sense and respond to changes (Felipe et al., 2016; Roberts, 2015). IT competency also plays an important role in the development and maintenance of an organization’s absorptive capacity (Roberts et al., 2012). According to IT business value model, IT competency generates business value, such as organizational performance, via intermediate business processes (Melville et al., 2004). Therefore, investigating absorptive capacity can fill the research gap in IT–agility relationship and provide a holistic and systematic understanding of the indirect link from IT competency to organizational agility (Iyengar et al., 2015).

Contingency theory indicates that the effects of organizational capabilities are contingent on contextual variables (Liu and Wang, 2016; Mao et al., 2016; Wade and Hulland, 2004). Contingent factors are environmental uncertainty, organizational commitment, and structure from both inside and outside organizations that can serve as potential moderators to investigate the effects of IT competency (Chen et al., 2014; Mao et al., 2015; Wade and Hulland, 2004). Information intensity is one of the significant and contingent factors in guiding the selection of competitive strategies (Porter and Millar, 1985). Tyagi et al. (2014) treat information intensity as one dimension that reflects the IT-enabled supply chain performance. The effects of IT managerial processes on IT investment strategy can also be moderated by information intensity (Ravichandran and Liu, 2011). The connection between organizational capabilities and organizational agility is strengthened specifically in information-intensive environment (Mao et al., 2015). The same situation may occur in processes in which IT shapes other high level of organizational capabilities, such as absorptive capacity. A correspondence between IT competency and information intensity should be established. Examining the moderating role of information intensity complements the existing framework of IT absorptive capacity value creation processes.

This study examines the processes by which IT competency affects organizational agility in information-intensive environment, focusing on the two following research questions:

1) Does absorptive capacity mediate the relationship between IT competency and organizational agility?

2) How does information intensity moderate the effects of IT competency on absorptive capacity?

2 Theoretical Background

2.1 IT competency and organizational agility

Organizational agility is an organizational level ability which enables the organization to detect and seize opportunities for innovations and competitive moves (Goldman et al., 1995; Sambamurthy et al., 2003). Consistent with Lu and Ramamurthy (2011), this study investigates the two types of organizational agility, namely, market capitalizing agility and operational adjustment agility, to reflect the na-
ture of sensing and responding abilities. Market capitalizing agility refers to the ability to sense, monitor, collect, and process external information to identify changes in the market and customer need (Lu and Ramamurthy, 2011). Operational adjustment agility is the responding agility refers to the ability to quickly adjust internal business processes according to the changes to improve product and service level (Sambamurthy et al., 2003). Both dimensions of agility are regarded extremely important when an economy enters globalization in a fast-moving market (Lu and Ramamurthy, 2011). The nature of organizational agility is complex, and thus scholars devote to identify its possible antecedents (Sherehny et al., 2007). Different types of IT competency are discussed in shaping agile organizations (Chen et al., 2014; Huang et al., 2012; Lu and Ramamurthy, 2011; Mao et al., 2015).

From the RBV, IT competency is more than a tool or an asset. It is an organizational capability for competitive advantages (Wade and Hulland, 2004), that is, organizational agility in our case. Researchers propose several types of typology of IT competency, such as technology, human, and relationship from resource perspective, and outside-in, spanning, and inside-out from space perspective. Consistent with Tippins and Sohi (2003), we define IT competency as the ability of an organization to understand and utilize IT resources and processes. Three types of IT competency, i.e., IT knowledge, operations, and objects, are identified in this study, as this typology presents co-specialized resources indicating the ability of an organization to manage information (Tippins and Sohi, 2003). IT knowledge refers to the level of possessed technical knowledge in an organization. IT operational capability can be considered as processes using IT to manage information of customers and market. IT objects refer to the artifacts, including hardware, software, and related personnel, which facilitate information flows. Although the relationship between IT competency and organizational agility is discussed, no consensus is reached on whether IT competency can enable organizational agility. At least three different arguments exist. 1) IT competency enables organizational agility by facilitating the information flow and accelerating decision-making processes (Chen et al., 2014; Lu and Ramamurthy, 2011). 2) IT competency shows negative effects on organizational agility because of technology dependency and unexpected errors (Allen and Boynton, 1991; Rettig, 2007). 3) IT competency can simultaneously be both an enabler and a disabler (Overby et al., 2006; Van Oosterhout et al., 2006). The present study aims to provide additional empirical evidence on the causal link between IT competency and organizational agility. Effects of different IT competency are stressed.

### 2.2 Mediating role of absorptive capacity

Consistent with the conceptualization of Cohen and Levinthal (1990), we view absorptive capacity as an organization’s ability to acquire, assimilate, transform, and exploit knowledge. It is a dynamic capability of knowledge management, which implicates competitive advantage, innovation, and organization performance (Joshi et al., 2010). This capacity is a knowledge-based construct that enhances the ability to absorb, value, and utilize knowledge (Roberts et al., 2012). Zahra and George (2002) re-conceptualize absorptive capacity and emphasize the dynamics toward strategic flexibility. The relationship between IT competency and absorptive capacity has been discussed both quantitatively and qualitatively in the literature (see Table 1), and positive and negative effects have been found from IT competency and absorptive capacity. Some scholars argue that IT enables absorptive capacity by facilitating knowledge flows both inside and outside organizations (Alavi and Leidner, 2001; Iyengar et al., 2015). Others point out that IT inspires absorptive capacity but cannot deliver it because knowledge is human related and complicated (Mohamed et al., 2006; Sambamurthy and Subramani, 2005). Therefore, the relationship between IT competency and absorptive should be taken a further consideration.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Quantitative/Qualitative</th>
<th>IT-related constructs</th>
<th>Absorptive capacity theory constructs</th>
<th>Effects</th>
<th>Main finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alavi and Leidner (2001)</td>
<td>Qualitative</td>
<td>IT</td>
<td>Knowledge creation, knowledge storage/retrieval,</td>
<td>Positive</td>
<td>IT links knowledge assets to ensure knowledge flows with extensive breadth and depth.</td>
</tr>
<tr>
<td>Reference</td>
<td>Qualitative/Quantitative</td>
<td>IT-related constructs</td>
<td>Absorptive capacity theory constructs</td>
<td>Effects</td>
<td>Main finding</td>
</tr>
<tr>
<td>----------------------</td>
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<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cooper and Molla (2016)</td>
<td>Quantitative</td>
<td>Sustainable IS exposure, sustainable IS prior experience, sustainable IS triggers</td>
<td>Knowledge transfer, knowledge application</td>
<td>Positive</td>
<td>Sustainable IS triggers, knowledge exposure and prior experience influence IS-environmental absorptive capacity, which contributes to organizational performance.</td>
</tr>
<tr>
<td>Iyengar et al. (2015)</td>
<td>Quantitative</td>
<td>Internal IT use</td>
<td>Absorptive capacity</td>
<td>Positive</td>
<td>Internal IT use directly and indirectly improves absorptive capacity.</td>
</tr>
<tr>
<td>Joshi et al. (2010)</td>
<td>Quantitative</td>
<td>IT</td>
<td>IT-enabled potential absorptive capacity, IT-enabled realized absorptive capacity</td>
<td>Positive</td>
<td>IT enables absorptive capacity for organizational innovations.</td>
</tr>
<tr>
<td>McDermott (1999)</td>
<td>Qualitative</td>
<td>IT</td>
<td>Knowledge management</td>
<td>Negative</td>
<td>IT inspires knowledge management but cannot deliver it because leveraging knowledge is difficult to achieve.</td>
</tr>
<tr>
<td>Mohamed et al. (2006)</td>
<td>Qualitative</td>
<td>IT</td>
<td>Knowledge management initiative</td>
<td>Negative</td>
<td>Current IT is immature to deal with knowledge in humanistic cognitive dimensions.</td>
</tr>
<tr>
<td>Roberts (2015)</td>
<td>Quantitative</td>
<td>Data integration, connectedness</td>
<td>Absorptive capacity</td>
<td>Positive</td>
<td>The interaction between data integration and connectedness positively influence absorptive capacity.</td>
</tr>
<tr>
<td>Sambamurthy and Subramani (2005)</td>
<td>Qualitative</td>
<td>IS</td>
<td>Knowledge coordination, knowledge transfer, knowledge reuse</td>
<td>Negative</td>
<td>Problems exist in using IS to support knowledge management.</td>
</tr>
<tr>
<td>Setia and Patel (2013)</td>
<td>Quantitative</td>
<td>Integrated IS capability</td>
<td>Potential operational absorptive capacity, realized operational absorptive capacity</td>
<td>Positive</td>
<td>Integrated IS capability improves market valuation through the positive effects of operational absorptive capacity.</td>
</tr>
</tbody>
</table>

Table 1. Representative sampling of previous research on IT competency and absorptive capacity

In IT business value model, synergies should be established between IT competency and absorptive capacity (Roberts et al., 2012). Lu and Ramamurthy (2011) highlight that a further examination on the mechanisms that learning ability driven by absorptive capacity can deepen the understanding of the relationship between IT competency and organizational agility. On one hand, IT competency is an organizational ability to build high-level organizational capabilities (Liu et al., 2013; Rai et al., 2006; Sambamurthy et al., 2003), such as absorptive capacity. IT competency enables organizational learning and facilitates the acquisition, assimilation, transformation, and exploitation of external knowledge (Liu and Deng, 2015). On the other hand, the outcomes of absorptive capacity are competitive moves that lead to enhanced performance (Volberda et al., 2010). Absorptive capacity represents the effectiveness in learning (Cohen and Levinthal, 1990), providing an organization with actual capability for mastering a given knowledge and modifying its existing practices (Pérez-Bustamante, 1999) to respond to changes. Thus, absorptive capacity is expected to mediate the relationship between IT competency and organizational agility.
2.3 Contingent role of information intensity

The inconsistent findings between IT competency and absorptive capacity also imply that RBV and KBV alone may not fully explain how IT shapes organizational capabilities. The contingency theory indicates that a fit between environment and technological characteristics should be established in an organization for competitive success (Lawrence et al., 1967). In this way, contingency theory may serve as a complimentary theory that offers new construct, that is, information intensity, to the IT business value framework (Mao et al., 2016). Information intensity refers to the content and extent of information use in an organization (Mao et al., 2015; Teo and King, 1997). In the information age, this construct is strategically important because it can help organizations to identify the priority of IT investment, thus leading to competitive advantage (Porter and Millar, 1985). The level of information intensity differs among various industries and markets (Mao et al., 2015). When an organization experiences high information intensity, the amount of information acquired and processed by its value chain is large. The standards of its services and techniques are also frequently updated. Thus, the organization must increase its efforts to deal with intensive information. From the contingency perspective, internal capability (absorptive capacity) and external environment (information intensity) must be fitted to each other. Combining RBV and absorptive capacity theory, we leverage contingency theory to provide a framework from IT competency to organizational agility in which information intensity serves as moderator.

3 Research Model and Hypotheses

The research model (see Figure 1) shows the positive effects of different IT competency on absorptive capacity and subsequently on both market capitalizing agility and operational adjustment agility. The moderating role of information intensity is also included in the model.

![Research Model](image)

Figure 1. Research model

3.1 Effects of IT competency on absorptive capacity

IT competency enables the rapid flow of information and knowledge throughout an organization, facilitates knowledge sharing, storing, and transferring, and provides platforms for generating new knowledge (Roberts, 2015; Roberts et al., 2012). The specific use of IT, such as knowledge management system or social networking services, could improve absorptive capacity of an organization. In particular, the sub-dimension of IT competency could improve absorptive capacity on its own way.
IT knowledge reflects the knowledge base and potential ability of an organization to use IT for solving business problems. When organizations are rich in IT experience, technical and managerial skills, and interpretation ability, the value of IT can be fully understood and easily fulfilled with no resistance. External knowledge, including knowledge about IT, can be easily obtained, assimilated, and utilized with the help of IT. Thus, we hypothesize the following:

**H1: IT knowledge positively influences absorptive capacity.**

IT operations are a process-based capability to improve information flows (Tippins and Sohi, 2003). Knowledge flows along processes in which information flows; thus, a well-designed and standardized process to leverage IT for managing information can guarantee the depth and width of knowledge flows (Alavi and Leidner, 2001). Therefore, with high-level IT operations, organizations can efficiently utilize the acquired knowledge. Therefore, we hypothesize that

**H2: IT operations positively influence absorptive capacity.**

The concept of IT objects extends to IT infrastructure and includes both technical and human bases (Tippins and Sohi, 2003). IT artifacts, i.e., IT objects, can offer a platform and serve as a fundamental base for processing information. The quality of hardware, software, and related personnel is important to facilitate information and knowledge flows. A flexible IT platform enables organizations to communicate and exchange information and knowledge among business units, thereby guaranteeing the reach and richness of knowledge (Liu et al., 2013). IT objects positively relate to absorptive capacity, and thus we argue that

**H3: IT objects positively influence absorptive capacity.**

### 3.2 Effect of absorptive capacity on organizational agility

Absorptive capacity enables the continuous development of an organization’s capabilities and embeds those capabilities in its operations (Vorhies et al., 1999). Malhotra et al. (2005) point out that organizations with superior absorptive capacity tend to be adaptive at sensing changes and responding to these changes. Transforming and exploiting knowledge also help business units become effective in developing superior product designs (Pavlou and El Sawy, 2006) when the demand of customers changes. Considering that agility refers predominantly to the ability to manage changes (Overby et al., 2006), absorptive capacity may positively relate to organizational agility. Liu et al. (2013) argue that absorptive capacity in an organization can positively affect its supply chain agility; Liao et al. (2003) also point out the positive effect of organizational absorptive capacity on organizational responsiveness. Thus, we hypothesize the following:

**H4: Absorptive capacity positively influences market capitalizing agility.**

**H5: Absorptive capacity positively influences organizational adjustment agility.**

### 3.3 Moderating effects of information intensity

According to contingency theory, a fit established between information intensity and IT competency is necessary for building a high level of organizational capabilities, that is, absorptive capacity. Specifically, in high information intensity, the effects of IT competency with absorptive capacity are strengthened. On one hand, an information-intensive environment calls for increased efforts toward IT to process information and absorb new knowledge. The level of information intensity identifies the priority and amount of IT investment in certain business processes (Porter and Millar, 1985). On the other hand, high information intensity makes business activities around products or services easy to be codified, standardized, and modularized (Mithas and Whitaker, 2007). The effects of IT competency to absorptive capacity are strengthened. We hypothesize that

**H6a–c: Information intensity positively moderates the relationship between IT competency (IT knowledge, operations, and objects) and absorptive capacity.**
3.4 Control variables

Four control variables are applied in our research model. IS age refers to the years since an organization started to use IS. IS size is measured by the ratio of employees in IS department to full-time employees. Organizational age refers to the years since the organization was founded. Organizational size is measured by the number of full-time employees. In the IS literature, organizational-level research frequently uses these four variables (Lu and Ramamurthy, 2011; Mao et al., 2016).

4 Research Methodology

4.1 Data collection

To test our research model, a survey instrument is developed to collect quantitative data in 300 representative organizations in China. An information management research center provided the contact list. The industry factors of selected companies vary from IT, finance, retailing, and agriculture to manufacturing. Therefore, we obtain data of high and low information intensity. From December 2012 to January 2013, we mailed out our questionnaires and received 165 valid questionnaires with a response rate of 55%. We asked senior managers with IS experience to answer the questions about IT competency, absorptive capacity, information intensity, and organizational agility of their own organizations. Among 165 respondents, 44 managers are in charge of the IS department. The respondents have worked in their current organizations for an average of 5.2 years. Table 2 provides the characteristic of research sample.

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Obs.</th>
<th>(%)</th>
<th>Organization Size (Number of Employees)</th>
<th>Obs.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>11</td>
<td>6.7</td>
<td>50–100</td>
<td>12</td>
<td>7.3</td>
</tr>
<tr>
<td>Information technology</td>
<td>21</td>
<td>12.7</td>
<td>100–200</td>
<td>10</td>
<td>6.1</td>
</tr>
<tr>
<td>Public sector</td>
<td>19</td>
<td>11.5</td>
<td>200–500</td>
<td>25</td>
<td>15.2</td>
</tr>
<tr>
<td>Education</td>
<td>13</td>
<td>7.9</td>
<td>500–1000</td>
<td>22</td>
<td>13.3</td>
</tr>
<tr>
<td>Finance</td>
<td>29</td>
<td>17.6</td>
<td>&gt;1000</td>
<td>79</td>
<td>47.8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>18</td>
<td>10.9</td>
<td>Total</td>
<td>165</td>
<td>100.0</td>
</tr>
<tr>
<td>Others a</td>
<td>54</td>
<td>32.7</td>
<td></td>
<td>Total</td>
<td>165</td>
</tr>
<tr>
<td>Total</td>
<td>165</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Obs.</th>
<th>(%)</th>
<th>Organization Age(Years)</th>
<th>Obs.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State-owned</td>
<td>76</td>
<td>46.1</td>
<td>≤5</td>
<td>18</td>
<td>10.9</td>
</tr>
<tr>
<td>Private</td>
<td>54</td>
<td>32.7</td>
<td>6–10</td>
<td>48</td>
<td>29.1</td>
</tr>
<tr>
<td>Sino-foreign joint venture</td>
<td>19</td>
<td>11.5</td>
<td>11–20</td>
<td>43</td>
<td>26.1</td>
</tr>
<tr>
<td>Wholly foreign owned</td>
<td>16</td>
<td>9.7</td>
<td>21–50</td>
<td>37</td>
<td>22.4</td>
</tr>
<tr>
<td>Total</td>
<td>165</td>
<td>100</td>
<td>&gt;50</td>
<td>19</td>
<td>11.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>Total</td>
<td>165</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Research sample

We also checked the non-response bias with a wave analysis. We compared the differences among key variables between early and late respondents. The t-test on the means of each construct shows that no significant difference exists. We assume that responses from late respondents are similar to non-responses (Keil et al., 2013); thus, our research is not threatened by the non-response bias. We also use the marker variable analysis to evaluate the common method bias using marker variable analysis (Lindell and Whitney, 2001; Malhotra et al., 2006). No significant changes are found between corrected and uncorrelated correlations of key variables, indicating that our research is not threatened by the common method bias. The testing tables are omitted because of the length limit of the paper. Results of Harman’s single-factor test show a similar result.
4.2 Construct measurement

We adopted measure items for all constructs from the existing literature. Their validities have already been tested. Consistent with prior papers, we modeled these constructs reflective on a Likert scale ranging from one to seven. One refers to “strongly disagree,” and seven represents “strongly agree.” We also conducted a pilot test among 15 businessmen to make this instrument friendly and reliable. Using their feedback, the final constructs and their measurement are modified and presented in Table 3.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Item</th>
<th>Measurement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT knowledge (ITKN)</td>
<td>ITKN1</td>
<td>Overall, our technical support staff is knowledgeable when it comes to computer-based systems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITKN2</td>
<td>Our firm possesses a high degree of computer-based technical expertise.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITKN3</td>
<td>We are very knowledgeable about new computer-based innovations.</td>
<td></td>
</tr>
<tr>
<td>IT operations (ITOP)</td>
<td>ITOP1</td>
<td>Our firm is skilled at collecting and analyzing market information about our customers via computer-based systems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITOP2</td>
<td>We routinely utilize computer-based systems to access market information from outside databases.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITOP3</td>
<td>We use computer-based systems to analyze customer and market information.</td>
<td>(Tippins and Sohi, 2003)</td>
</tr>
<tr>
<td>IT objects (ITOBI)</td>
<td>ITOB1</td>
<td>Our company houses a formal MIS department.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITOB2</td>
<td>Our firm employs a manager whose main duties include the management of our information technology.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ITOB3</td>
<td>Our firm’s members are linked by a computer network.</td>
<td></td>
</tr>
<tr>
<td>Information intensity (II)</td>
<td>II1</td>
<td>In our industry, potential customers require substantial product or service information before buying.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II2</td>
<td>In our industry, frequent use of information is required in our production or service operations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II3</td>
<td>Information is used to a great extent in the operation (e.g., R&amp;D processes) of the product or services.</td>
<td></td>
</tr>
<tr>
<td>Absorptive capacity (AC)</td>
<td>AC1</td>
<td>My organization utilizes formal processes (e.g. meetings with customers or third parties) to acquire new knowledge.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC2</td>
<td>My organization is effective in transforming existing information into new knowledge.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC3</td>
<td>My organization practices effective routines to identify, value, and import new information and knowledge.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC4</td>
<td>My organization periodically holds meetings to communicate the market trends and latest innovations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC5</td>
<td>My organization carries out formal processes to share the best practical experience among business units.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC6</td>
<td>My organization can use and exploit internal and external information and knowledge into concrete applications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC7</td>
<td>My organization can use knowledge to development new product or services.</td>
<td>(Jansen et al., 2005; Pavlou and El Savry, 2006)</td>
</tr>
<tr>
<td>Market capitalizing agility (MCA)</td>
<td>MCA1</td>
<td>We are quick to make and implement appropriate decisions in the face of market/customer changes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MCA2</td>
<td>We constantly look for ways to reinvent/reengineer our organization to better serve our market place.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MCA3</td>
<td>We treat market-related changes and apparent chaos as opportunities to capitalize quickly.</td>
<td></td>
</tr>
<tr>
<td>Operational adjustment agility (OAA)</td>
<td>OAA1</td>
<td>My organization can make a rapid response to fulfill demands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OAA2</td>
<td>My organization can quickly adjust production or service levels to support fluctuations based on market demands.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Constructs and measurement
5 Results

5.1 Measurement model

As partial least squares (PLS) can utilize a small sample size to maximize the explained variance in the dependent variable (Chin, 1998); thus, we used SmartPLS to test our research model. We calculated average variance extracted (AVE), item-to-construct loading, and composite reliability (CR) to evaluate the internal consistency and convergent validity. The minimum item to construct loading is 0.79 higher than suggested the 0.70 (Chin, 1998). The differences between item to construct loading and cross-loadings on other constructs are higher than the suggested threshold of 0.1 (Gefen and Straub, 2005). The value of Cronbach’s Alpha and CR of all constructs are above 0.7 (Nunnally and Bernstein, 1994). All AVEs are above 0.5 and the square-roots of each AVE are greater than the correlation of a pair of constructs (Fornell and Larcker, 1981; Hair et al., 1998). The value of variance inflation factors of all constructs is below 2.61, implying that no multicollinearity threatens our study (Liu, 2016). All these indicators show good reliability, discriminate validity and convergent validity of our measures. Table 4 presents the average value (MEAN), standard deviation (SD), Cronbach’s Alpha, correlations of key constructs and their AVEs and CRs.

![Table 4. Descriptive statistics, correlations and reliability](image)

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Cronbach's Alpha</th>
<th>AC</th>
<th>II</th>
<th>ITKN</th>
<th>ITOB</th>
<th>ITOP</th>
<th>MCA</th>
<th>OAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>5.22 (0.88)</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>5.24 (1.01)</td>
<td>0.84</td>
<td>0.39</td>
<td></td>
<td>CR=0.90; AVE=0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITKN</td>
<td>4.98 (1.13)</td>
<td>0.85</td>
<td>0.59</td>
<td>0.48</td>
<td>CR=0.91; AVE=0.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITOB</td>
<td>5.16 (1.21)</td>
<td>0.92</td>
<td>0.57</td>
<td>0.55</td>
<td>0.68</td>
<td>CR=0.95; AVE=0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITOP</td>
<td>5.16 (1.16)</td>
<td>0.88</td>
<td>0.63</td>
<td>0.45</td>
<td>0.54</td>
<td>0.63</td>
<td>CR=0.92; AVE=0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA</td>
<td>5.16 (0.94)</td>
<td>0.87</td>
<td>0.69</td>
<td>0.36</td>
<td>0.49</td>
<td>0.39</td>
<td>0.53</td>
<td>CR=0.92; AVE=0.79</td>
<td></td>
</tr>
<tr>
<td>OAA</td>
<td>5.07 (1.09)</td>
<td>0.89</td>
<td>0.64</td>
<td>0.40</td>
<td>0.49</td>
<td>0.50</td>
<td>0.53</td>
<td>0.68</td>
<td>CR=0.95; AVE=0.90</td>
</tr>
</tbody>
</table>

5.2 Hypothesis testing

Seven models in PLS from M1 to M6 were used to test our hypotheses. M1 to M3 were developed to test the moderating effects of information intensity on absorptive capacity in a hierarchical regression analysis following the procedures suggested by Liu (2015) and Liu and Wang (2016) in IS research. To examine the mediating effects of absorptive capacity, we followed the three step procedures suggested by Bardon and Kenny (1986). Table 5 presents the results of regression analysis reporting standardized path coefficients, explained variances ($R^2$), effect sizes ($f^2$) and F value in each model.
Table 5. Results of regression analysis

In M1, only IS age ($\beta = 0.21$, $p < 0.01$) shows positive and significant effects on absorptive capacity, indicating that organizations with old IS department usually possess strong absorptive capacity. In M2, IT knowledge ($\beta = 0.32$, $p < 0.01$) and IT operations ($\beta = 0.39$, $p < 0.01$) positively influence absorptive capacity, but IT objects ($\beta = 0.10$, $p > 0.05$) do not. The explained variance of absorptive capacity ($R^2$) of M2 is 0.42. Thus, H1 and H2 are supported, but H3 is not.

M3 tests the effects of the interactions between different IT competency and information intensity on absorptive capacity. The interaction terms between IT competency and information intensity with positive and significant coefficients (IT operations $\beta = 0.12$, $p < 0.05$; IT objects $\beta = 0.16$, $p < 0.01$) indicate significant effects on absorptive capacity, except for IT knowledge ($\beta = -0.07$, $p > 0.05$). The three interaction terms increase by 10% of the explained variance of absorptive capacity from M2 to M3. The F value of M3 in Table 5 indicates that changes in the explained variance of absorptive capacity are significant. Information intensity positively moderates the relationship between IT operations and absorptive capacity and that between IT objects and absorptive capacity. In M3, the effect of IT objects on absorptive capacity is also positive and significant ($\beta = 0.16$, $p < 0.05$) although insignificant in M2 ($\beta = 0.10$, $p > 0.05$), thus strengthening our findings. H4b and H4c are supported, but H4a is not.

In M6, the effects of absorptive capability are positive and significant on market capitalizing agility ($\beta = 0.57$, $p < 0.01$) and operational adjustment agility ($\beta = 0.45$, $p < 0.01$), indicating that H5 and H6 are supported. Figure 2 shows PLS results of research model (M3 and M6).
M4–6 test the mediating effects of absorptive capacity on the relationship between IT competency and organizational agility. In M4, the effects of IT objects on both types of agility are insignificant, implying that no direct or indirect effects are found from IT objects. In M5, IT knowledge and operations exert positive and significant effects on both types of agility. When adding absorptive capacity in M6, the significant level of path coefficients decreases. For the effects of IT knowledge and operations on market capitalizing agility, the path coefficients remain significant. The Sobel test results indicate significant indirect effects of IT knowledge (Z = 2.72, p < 0.05) and operations (Z = 2.92, p < 0.05) on market capitalizing agility through absorptive capacity. The effects of both IT knowledge and operations on operational adjustment agility become insignificant, implying that absorptive capacity fully mediates their relationships.

6 Discussions and Implications

6.1 Theoretical implications

Previous studies have offered a framework from IT competency to the outcomes of absorptive capacity in IT business value themes (Melville et al., 2004; Roberts et al., 2012). The present study empirically investigates this framework in an organizational agility discipline by extending traditional RBV with KBV and contingency theory. Mediating effects of absorptive capacity and the moderating effects of information intensity are found in the causal link between the different IT competency and two types of organizational agility. These findings lead to several theoretical implications.

First, this study extends the research on IT–organizational agility relationship by introducing KBV and provides empirical results. As a knowledge-based construct, absorptive capacity is important in understanding how IT competency creates business value (Iyengar et al., 2015; Roberts, 2015). On one hand, our findings support a direct link between IT knowledge and operations and absorptive capacity. By contrast, a possible and significant effect of IT objects only exists in high information intensity. On the other hand, absorptive capacity facilitates market capitalizing agility and operational adjustment agility, that is, both the sensing and responding aspects of organizational agility. Absorptive capacity can also partially mediate the effects of IT knowledge and operations on market capitalizing agility and fully mediate those effects on operational adjustment agility. These findings suggest that different IT competency distinctly shape various types of organizational agility. Invoking absorptive capacity deepens the understanding of the direct and indirect effects of IT competency on organizational agility.
Second, this study combines contingency theory with traditional RBV and KBV to examine the effects of external factors on IT–agility framework. External factors may not directly influence the development of organizational agility, but they are important in selecting business strategies (Cooper and Mol-la, 2016; Liu and Wang, 2014). We find that the effects of IT operations and objects on absorptive capacity can be strengthened with high information intensity. This finding highlights that information intensity is an important variable in the synergies between IT competency and absorptive capacity (Roberts et al., 2012), shedding light on how IT competency contributes to absorptive capacity. The effect of the interaction term between IT knowledge and information intensity remains insignificant may be reasonable because knowledge and information are always co-related.

Third, this study fully investigates the effects of IT competency on organizational agility at a subtle level. Although IT knowledge, operations, and objects are correlated, their effects vary. In terms of the direct and indirect effects of IT competency on organizational agility, IT objects differ from others. This finding may imply that the managerial aspect of IT competency is more important than the technical aspect in shaping agility. The technical aspect is losing its competitive value because of continuous IT commoditization (Bhatt and Grover, 2005). Regarding the examination of mediations, absorptive capacity partially and fully mediating the relationship between IT knowledge and operations and different types of organizational agility. By contrast, IT objects show an insignificant effect on both types of organizational agility and a potentially significant negative effect on market capitalizing agility. This finding explains the inconsistent findings between IT and agility.

6.2 Practical implications

This study also bears practical implications. First, organizations should focus on leveraging IT competency for high level of organizational capabilities. IT competency can facilitate organizational agility both directly and indirectly. Absorptive capacity enabled by IT competency facilitates organizational agility by spotting market trends, competitor moves, and potential risks from external environment (Liu et al., 2010), transferring that information into useful knowledge, storing this knowledge in IS, and assimilating the stored knowledge for effective decision making (Chen and Chang, 2012; Liu et al., 2013). Developing a synergy between IT competency and absorptive capacity is important for both types of organizational agility.

Second, organizations should assess the level of information intensity to select an appropriate IT strategy for shaping absorptive capacity. Information intensity is important because it affects the value creation of IT competency. Our findings highlight that IT operations and objects should be developed in coordination with information intensity. In high information intensity, organizations should devote efforts in developing IT artifacts and related processes. In doing so, a high level of organizational capability, such as absorptive capacity and organizational agility, can be easily established.

Third, a trade-off for investing in different IT competency should be considered in supporting organizational capabilities in high level. The sensing and responding abilities of an organization require different amounts and types of IT competency (Lu and Ramamurthy, 2011). The development of IT and agility strategies should be integrated. The role of IT objects in shaping higher organizational capabilities may be different compared with the other two; this competency usually exerts no effects on agility and may occasionally create barriers. Organizations should also notice that in shaping organizational agility, especially operational adjustment agility, IT knowledge and operations may not function effectively when absorptive capacity is not appropriately set up. Investment in IT operations can also be complex; this ability should be developed to fit not only internal ability (absorptive capacity) but also external factor (information intensity).

6.3 Limitations and directions for future research

Our study has several limitations. First, sample size of 165 organizations is relatively small. A larger sample size will generate a better statistical power. Second, this study is not a matched-pair design
survey. Bias may exist when IS managers exaggerate the value of IT competency, or general managers misreport the questions related to IT. A matched-pair design can overcome the influences from these social desirability concerns. Third, this study is limited to organizations in China. As differences in cultures and technical environment exist across countries, we are not sure whether the findings of our research can be generalized to other countries. Future research will seek to gather data from multicultural countries to increase the generalizability of the research. Fourth, some measurement items of the construct should be updated. For example, the measurements of IT objects are generic and exclusive from today’s vantage point. Future research will exert efforts in the measurement development for this variable in today’s new environment. Finally, a longitudinal study or complementary qualitative study may extend this study by providing additional information about the causal link from IT competency to organizational agility via absorptive capacity.

Our findings point out a few directions for future research. First, interactions among three types of IT competency can be examined. For our study, IT knowledge, IT objects and IT operation are co-specialized resources. Their complementary or substitute relationships will bring in new knowledge around our topic. Second, other context variables (e.g., culture, structure, and uncertainty) may exist within the IT–absorptive capacity–agility relationship and moderate the influence of IT competency and absorptive capacity on organizational agility. Third, future research may examine the different information intensities among types of products, services, or value chains. In this way, a detailed and comprehensive fit between IT competency and information intensity can be obtained and studied.

7 Conclusions

In conclusion, this study integrates RBV, KBV and contingency theory to empirically examine the framework of leveraging IT competency for organizational agility. The proposed framework contributes to the causal link between IT competency and organizational agility and explains how different IT competency contributes to the two types of organizational agility in cooperation with absorptive capacity and information intensity. In particular, IT objects exert no direct and indirect effects on organizational agility. Absorptive capability fully and partially mediates the effects of IT knowledge and operations on organizational agility, but no mediations are found in IT objects. The results also show that information intensity can strengthen the effects of IT operations and objects on absorptive capacity.

This research contributes to knowledge management literature in three ways. First, this study identifies the roles of knowledge-based capability (absorptive capacity) of an organization in IT competency and organizational agility relationship. In IT business value model, IT competency could strengthen organizational agility via knowledge processes. Second, this study points out and empirically examines the coefficients from diverse types of IT competency to absorptive capacity. In enhancing knowledge processes, the effects of IT knowledge, operations and objects are different. Finally, this study describes a way of how IT competency can affect absorptive capacity by establishing a fit with information intensity.

Acknowledgments

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References:


