Entrepreneurial Perceptions and E-business Opportunity Discovery: Evidence from China

Completed Research Paper

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Abstract

In the era of e-business, firms are changing existing business models and/or create new business models through the discovery of e-business opportunities. However, how entrepreneurial perceptions can be activated to discover e-business opportunities is still underexplored. This study proposed a research model that integrated the subjectivist theory of entrepreneurship (STE), the resource-based view and the institutional theory to explain how external pressures and IT infrastructure maturity influence entrepreneurial perceptions, which further promote the discovery of e-business opportunities. Data collected from 203 traditional firms in China was used to examine the research model. The result supported that the causal relationships from external pressures and IT infrastructure maturity to e-business opportunity discovery are partially mediated by entrepreneurial perceptions. In addition, external pressures and IT infrastructure maturity pose different effects on three types of entrepreneurial perceptions. Practitioners looking for innovative use of e-business should view external pressures as an external driving force and IT infrastructure as an internal driving force for motivating entrepreneurial perceptions.

Key Words: China, entrepreneurial perceptions, e-business opportunity discovery, institutional theory, IT infrastructure, subjectivist theory of entrepreneurship

Introduction

E-business technologies, specifically the Internet and web-based applications, feature open-standard settings, broad connectivity, and interoperability (Vakharia 2002; Zhu and Kraemer 2005). These technologies have revolutionized firms’ operations, services, and market competition (Devaraj et al. 2007; Setia et al. 2013). These net-enabled revolutions enable firms to reach out to new markets, attract broader customer base, deliver innovative products and services, and improve coordination with supply chain partners (Zhu et al. 2015). E-business technologies are increasing opportunities for firms to reconsider their business models, operational processes and partnerships along the whole supply chain (Feeny 2001).

Furthermore, e-business has become strategic opportunities for a firm to digitalize its business transactions and promote economic development of the firm (Amit and Zott 2001; Chatterjee et al. 2002; Zhao et al. 2008; Yao and Zhu 2012). E-business opportunities have been recognized as one of the major business opportunities during recent economy recovery period in the U.S. (Dahl 2012). In China, an industrial report from iResearch Consulting Group (one leading market research consultant in China) also suggests that e-business opportunities are essential for firms’ product and service design, operations, marketing, and market competition in traditional or offline industries (Huang 2014). Keqiang Li, the Premier of China, proposed “Internet Plus” as one of the major national strategies in the 2015 government
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The report detailed government plans of assisting offline firms in traditional industries to exploit e-business opportunities to reconfigure their operations (ChinaFinance 2015).

To respond to intense market competition, traditional firms are suggested to change existing business models and/or create new business models through the discovery of e-business opportunities (Feeny 2001). E-business opportunities are critical for firms in traditional industries to revolutionize their products and services (Chen et al. 2014). E-business opportunities discovery is defined in this study as entrepreneurs’ capability of identifying e-business opportunities for reconfiguring business model and operational processes. Research has used the entrepreneurship theory to investigate opportunity discovery and made significant contribution (Phan 2004; McMullen and Shepherd 2006; Kor et al. 2007; Phillips and Tracey 2007; Auerswald 2008; Vaghely and Julien 2010). However, most of these studies either were conducted in a non-digital context, such as opportunity discovery in a firm’s research and development (R&D) process or focused on the discovery of non-digital opportunities, such as opportunity discovery in a new venture (Wiklund and Shepherd 2003; Vaghely and Julien 2010). Therefore, how to discover e-business opportunities is still underexplored.

Moreover, this study has a special interest to investigate this issue in an emerging/developing market like China. Through legal regulations and public investments, the China government has endeavored to promote widespread use of the Internet and mobile technologies in both individuals and organizations. As a result, in 2013, the gross merchandise volume (GMV) of e-business, including B2B and B2C transactions in China, reached about 10 trillion RMB (iResearch 2014). The dissemination of e-business technologies in emerging/developing markets poses two issues for firms in traditional industries.

First, as more and more partners, customers, and competitors applied e-business technologies in their operations, the market share of offline transactions has been gradually replaced by e-business transactions. As such, firms in traditional industries face external pressures from e-business transactions. Firms are wondering how to discover innovative use of e-business technologies under such external pressures. Second, as firms in traditional industries usually have weaker IT infrastructure than e-business firms, these firms may experience difficulties in discover e-business opportunities and thus are wondering how IT infrastructure of the firm may be deployed for the discovery of e-business opportunities. While the importance of e-business opportunities discovery for traditional firms, little is known about how an entrepreneur can discover e-business opportunities. Therefore, we try to address the following research question in this study:

**How does an entrepreneur of a firm discover e-business opportunities?**

This study proposed a research model that integrated the subjectivist theory of entrepreneurship (STE) (Mahoney and Michael 2005; Kor et al. 2007), the resource-based view (Barney 1991) and the literature on institutional pressures (DiMaggio and Powell 1983; Teo et al. 2003) to explain how external pressures and IT infrastructure maturity influence entrepreneurial perceptions, and how entrepreneurial perceptions influence the discovery of e-business opportunities. Based on STE, our research model argues that a firm’s external pressures and IT infrastructure maturity influence entrepreneurial experiences, which in turn promote the discovery of e-business opportunities. This study proposed and examined the roles of three different entrepreneurial experiences (i.e., collaborative experience, planning experience, and operational experience) in the firm’s discovery of e-business opportunities. To our knowledge, this is the first study to conceptualize the entrepreneurial experience constructs and to theorize how they promote e-business opportunity discovery.

The rest of the paper is organized as follows. The next section presents STE, which explains the concept of entrepreneurial discovery and underlies our research model. Then the research hypotheses are presented. We then test the proposed relationships and present the result, using survey data collected from 203 manufacturing and service firms in China. Next, theoretical contributions and practical implications are discussed. The limitations of the study are also outlined for further research.
Theories Development and Hypotheses

Subjectivist Theory of Entrepreneurship (STE)

The extant literature that has studied the discovery of entrepreneurial opportunity has two main schools. In one school, the theory of neoclassical equilibrium assumes that all entrepreneurial opportunities are available to everyone. The discovery of opportunities depends on an entity’s risk-propensity and thus any entity can discover entrepreneurial opportunities (Khilstrom and Laffont 1979). Another school, the Austrian economics theory, assumes that an entity cannot identify all opportunities. In this research stream, the process of opportunity discovery depends on an entity’s capability, willingness and experience (Kirzner 1997).

Subjectivist Theory of Entrepreneurship (STE) focuses on the impact of entrepreneurs’ knowledge, capabilities, and resources on the opportunity discovery processes (Mahoney and Michael 2005). STE rejects neoclassical microeconomic theory’s strict definition of perfect economic rationality, and deals constructively with both entrepreneurs’ creativity and the knowledge-creation processes (Mahoney and Michael 2005; Kor et al. 2007). STE builds on Penrose’s resource approach to establish links between entrepreneurial knowledge/experience and entrepreneurial creativity (Penrose 1959). Firms go through a discovery procedure of entrepreneurial opportunities before evaluating and realizing an innovation, as STE argued: “The decision to search for opportunities is an enterprising decision requiring entrepreneurial intuition and imagination, and must precede the ‘economic’ decision to go ahead with the examination of opportunities for expansion” (Penrose, 1959, p. 34). For the discovery procedure of entrepreneurial opportunities, STE suggests a close causal relationship between a firm’s resources and entrepreneurial experiences (the ideas, experience, and knowledge of its management teams), which further leads to the process of entrepreneurship discovery.

Based on STE, the discovery procedure of entrepreneurial opportunities stem from seizing the opportunities afforded by environment dynamics and organizational resources (Smith and Gregorio 2002; Siegel and Renko 2012). First, environment dynamics act as economically valuable exploration opportunities (Witt 1998; McGrath 2001; Kor et al. 2007). Firms learn knowledge, and discover opportunities from dynamics of various outside market activities, such as partners alignment (Kaplan 2008), new technology applications (Kim et al. 2013), and strategic sourcing (Su 2013). External partners’ pressures, consumer economics, political actions, and regulatory standards may stimulate firms to pursue opportunity discovery. Second, firms also seek organizational resources to develop these opportunities and turn entrepreneurial visions into business reality. A firm’s idiosyncratic resources can serve as cognitive drivers of future strategy via ‘resource learning’ (Spender 1996). Organizational resources exploration will add chance of creating new economic opportunities, and improve a firm’s utilizing of these opportunities (Mosakowski 1998).

In this paper, we argue that external pressures and IT infrastructure maturity affect a firm’s entrepreneurial experiences and drive the entrepreneurial discovery procedure for e-business. External pressures refer to the degree of institutional pressures from external partners, customers and competitors for adopting e-business applications in a certain industry or region (Ke et al. 2009). IT infrastructure maturity is defined as the degree to which the organizational IT Infrastructure can ensure the availability for the e-business applications (Ragowsky et al. 2012). External pressures represent environment dynamics in STE (Kor et al. 2007) and reflect the external power imperative to adopting e-business applications; IT infrastructure maturity represents the sufficiency of internal resources for facilitating e-business applications (Lin et al. 2007; Ragowsky et al. 2012). These two forces from external environment and internal heterogeneous organizational resources will drive the process of forming entrepreneurial experiences, which later promote the discovery of e-business opportunities.

Entrepreneurial Discovery Procedure for E-business Opportunities

STE suggests that entrepreneurial experience perception stem from the entrepreneur’s evaluation of environment dynamics and organizational resources (Kor et al. 2007). These entrepreneurial experience perceptions affect the discovery of entrepreneurial opportunities of a firm. Entrepreneurial experience perceptions originate from three experiences: the industry, the management team and the firm operations (Alvarez and Barney 2007; Kor et al. 2007).
First, industry-specific experience involves interactions with buyers, suppliers, distributors, and other stakeholders. Such industry-specific experience produces knowledge about the opportunities, threats, competitive conditions, and governmental regulations that are unique to the entrepreneur’s industry. Second, entrepreneurs’ experience of management team includes experiences of discussing and debating on strategic decisions, taking risks on behalf of the firm, and committing economically to certain strategic actions under uncertainty (Kor 2003). This kind of experience in many firms may help entrepreneurs to develop strategic skills for opportunity discovery. Lastly, entrepreneurs also gain operational experience over time through leveraging, managing, and developing firm’s heterogeneous resources.

Therefore, we identify collaborative experience perception, planning experience perception, and operational experience perception as the entrepreneurial perception about the industry, the management team, and the firm’s operations. Collaborative experience perception, defined as the degree to which the entrepreneurs are able to understand its experiences of e-business collaborations with its partners, will produce perception about the collaborative opportunities in an e-business environment. Planning experience perception is defined as the degree to which the entrepreneurs are able to understand experiences of e-business strategic planning. Such experience will help the firm to identify strategic opportunities of e-business for the organization. Operational experience perception, defined as the degree to which the entrepreneurs are able to understand experiences of e-business operations, will create insights concerning operational opportunities.

We argue that external pressures and IT infrastructure maturity of a firm affect an entrepreneur’s understanding of these three experiences, which in turn promote e-business opportunity discovery. Figure 1 presents our research model and Table 1 lists the construct definitions.

![Figure 1. Research model](image-url)
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Table 1. Construct Definition

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Definition</th>
<th>Supporting References</th>
</tr>
</thead>
<tbody>
<tr>
<td>External pressures</td>
<td>The degree of institutional pressures from external partners, customers and competitors for adopting e-business applications in a certain industry or region.</td>
<td>(Liang et al. 2007; Ke et al. 2009)</td>
</tr>
<tr>
<td>IT Infrastructure Maturity</td>
<td>The degree to which the focal firm’s IT Infrastructure can ensure the availability for the e-business applications.</td>
<td>(Lin et al. 2007; Ragowsky et al. 2012)</td>
</tr>
<tr>
<td>Collaborative Experience Perception</td>
<td>The degree to which the entrepreneurs are able to understand experiences of e-business collaborations with partners.</td>
<td>(Kor et al. 2007)</td>
</tr>
<tr>
<td>Planning Experience Perception</td>
<td>The degree to which the entrepreneurs are able to understand experiences of e-business strategic planning.</td>
<td>(Kor et al. 2007)</td>
</tr>
<tr>
<td>Operational Experience Perception</td>
<td>The degree to which the entrepreneurs are able to understand experiences of e-business operations.</td>
<td>(Kor et al. 2007)</td>
</tr>
<tr>
<td>E-business Opportunity Discovery</td>
<td>The degree to which the entrepreneurs are able to recognize opportunities to reconfigure business models and operational processes for e-business.</td>
<td>Developed for this study</td>
</tr>
</tbody>
</table>

Research Hypotheses

The Effects of entrepreneurial experiences perception on e-business opportunities discovery

Drawing on previous research on STE (Kor 2003; Mahoney and Michael 2005; Kor et al. 2007), we suggest that entrepreneurs' capability of recognizing the firm’s e-business opportunity is influenced by their collaborative experience perception, planning experience perception, and operational experience perception.

Collaborative experience stems from a firm’s interactions with the firm’s partners in the supply chain (Kor et al. 2007). Such perception reflects the ability of entrepreneurs for understanding the firm’s accumulated experiences of relationship management for various partners. The resource dependence theory suggests that interdependence acts as the key motivation for firms to enter inter-organizational relationships (Gulati 1995; Pfeffer and Salancik 2003). While, on the one hand, firms loss their independence and depend on their collaboration with partners, these firms, on the other hand, can gain access to valuable resources and capabilities through these relationships (Medcof 2001). Experienced managers can leverage collaborative experience and knowledge to initiate new business model for their current firm (Kor et al. 2007). Thus, in a firm with more historical collaborative experience, entrepreneurs possessing collaborative experience and being able to understand the experience could better discover e-business opportunities for the firm. Therefore, we propose:

H1a: Collaborative experience perception is positively associated with e-business opportunity discovery.

Planning experience involves management teams’ sharing with each other teamwork experience and knowledge that support new e-business decisions and implementation. This perception is based on the ability of entrepreneurs for understanding historical teamwork experiences, teamwork skills, and inter-relationships. The sharing of teamwork experience within a management team member contributes to a firm’s entrepreneurial renewal (Kor et al. 2007), because a collaborative team can focus on particular e-business problems and thus accelerate the team’s decision making. Thus, in a firm with more historical planning experience, entrepreneurs are more capable of innovating strategic use of e-business
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H1b: Planning experience perception is positively associated with e-business opportunity discovery.

Operational experience involves a firm’s historic experience about organizational structure, business operations and routines for e-business (Mosakowski 1998; Kor et al. 2007). Operational experience perception enables entrepreneurs to know how to utilize the firm’s resources, capabilities, and operations procedures to create new e-business opportunities (Kor et al. 2007). Operational experience constitutes an important part of a firm’s entrepreneurial capability of creating strategic e-business opportunities. A firm’s accumulated operational experience (e.g., IS technical experience and IT management knowledge) enables the firm to leverage existing operations and routines to better match entrepreneurial opportunities. Thus, in a firm with more historical operational experience, entrepreneurs possessing firm-specific operational experience and being able to understand the experience could better envision e-business opportunities for the firm. Therefore, we propose:

H1c: Operational experience perception is positively associated with e-business opportunity discovery.

The Effects of environment pressures on entrepreneurial perceptions

SET suggests entrepreneurs can learn from dynamics and interdependence in various external market (Kor et al. 2007). Research has suggested that pressures from the external environment affect top management beliefs (Liang et al. 2007). We identify external pressures as an environmental driving force that activates entrepreneurial perceptions in e-business opportunity discovery procedure. Institutional theory suggests that the institutional environment provides rule-like social expectations and norms for organizational structures, operations, and behavior change (DiMaggio and Powell 1983). As organizations compete for market share, customers’ needs, and political power, organizations face external pressures to conform to these shared notions of appropriate forms. In order to establish organizational legitimacy, organizations hedge against uncertainties and thus gain social support (DiMaggio and Powell 1983; Teo et al. 2003; Ke et al. 2009). DiMaggio and Powell (1983) identified three types of institutional pressures—coercive, mimetic, and normative pressures—and suggested that the coercive and normative pressures operate through interconnected relations while mimetic pressures act through structural equivalence.

We argue that the external coercive pressures from relational channels will affect collaborative experience perception. Coercive pressures are usually defined as formal or informal pressures originated from influences exerted by powerful supply chain partners on which a firm depends (Teo et al. 2003; Ke et al. 2009). For example, embedded in the e-business collaborative network, coercive pressures are requirements raised by constituents from suppliers and customers. The pressure will lead to entrepreneurial perceptions about e-business collaborative experience for potential digital strategic innovation and operational process change. Therefore, external pressures from supply chain partners and collective expectations will improve entrepreneurial perceptions of how to use collaborative experience for a firm’s potential e-business innovation. This leads to the following hypothesis:

H2a: External pressures are positively associated with collaborative experience perception.

Furthermore, we argue that external pressures, specifically coercive and mimetic pressures, affect entrepreneurial planning experience perception. Coercive pressures are more likely to arise from dominant partners, and could be especially pronounced in emerging markets like China where the digital economy is still in developing stage. When a dominant partner adopts e-business planning practices or structures to serve its business interests, the focal firm will try to comply with the demand. In a similar manner, mimetic pressures also affect planning experience perception. Mimetic pressures refer to the pressures from a firm’s perceived success of competitors’ actions (Teo et al. 2003; Ke et al. 2009), which reflects entrepreneurial perceptions for the environment competitive status. Given the inherent uncertainty of e-business opportunities, a firm exhibits the tendency to imitate the strategic action taken by their successful peers or competitors (Liang et al. 2007). Therefore, external coercive and mimetic pressures will improve entrepreneurial perceptions of how to learn and accumulate e-business strategic planning experience from dominant partners. This leads to the following hypothesis:

H2b: External pressures are positively associated with planning experience perception.

Finally, we suggest that external normative pressures from supply chain will have positive effect on operational experience perception. Normative pressures refer to the pressures from collective
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expectations within relational channels, which increase the strength of these norms on organizational behavior (Teo et al. 2003; Ke et al. 2009). Such pressures from external dominant partners’ e-business practices will influence a firm’s attitudes toward the maintenance and development of digital operations activities through collective e-business application behaviors (Ke et al. 2009). Therefore, external normative pressures will improve entrepreneurial perceptions of how to realize standard digital supply chain operations through learning and accumulate e-business operational experience. This leads to the following hypothesis:

H2c: External pressures are positively associated with operational experience perception.

The Effects of IT infrastructure maturity on entrepreneurial perceptions

The resource-based view suggests that tangible or intangible assets/resources controlled by a firm will enable a firm to conceive and implement various business strategies and innovation to gain competitive advantage (Wernerfelt 1984). Given the heterogeneity contributes of organizational resources, SET highlights that entrepreneurs seek resources to develop entrepreneurial opportunities and turn entrepreneurial perceptions into business reality through deploying, and mobilizing resources (Kor et al. 2007). IT infrastructure maturity represents technical resource advantage for facilitating a firm’s insights for e-business innovation applications (Ragowsky et al. 2012).

IT infrastructure allows a firm to develop broad-based collaboration with supply chain partners, and thus increases the firm’s experience and ability to make in-depth connections among market information, knowledge, and concepts (Jean et al. 2014). IT infrastructure also can help a firm quickly identify customer needs through IT-enabled interacting with customers, thereby enabling the firm to identify new market segments and product/service innovation (Setia et al. 2013). Therefore, IT infrastructure maturity provides entrepreneurial perceptions source of how to use collaborative experience for a firm’s potential e-business innovation. This leads to the following hypothesis:

H3a: IT infrastructure maturity is positively associated with collaborative experience perception.

A firm with high IT infrastructure maturity may have abundant planning experience in IT applications. Such experience fosters great confidence and knowledge for e-business initiatives. The accumulation of planning experience is instrumental in the sense making process of how management team members share with each other to develop teamwork skills, and supports new e-business strategic decisions process and implementation. Therefore, IT infrastructure maturity fosters entrepreneurial perceptions of how to use planning experience for a firm’s potential e-business innovation. This leads to the following hypothesis:

H3b: IT infrastructure maturity is positively associated with planning experience perception.

IT infrastructure provides visibility across inter-functional areas, which strengthens the connections between procurement, sales, logistics and customer services departments (Devaraj et al. 2007). IT infrastructure maturity also improves efficiency of digital operations and facilitates collaboration to create insights concerning new business opportunities. Therefore, IT infrastructure maturity provides the source of entrepreneurial perceptions of how to leverage the operational experience in e-business applications. This leads to the following hypothesis:

H3c: IT infrastructure maturity is positively associated with operational experience perception.

Research Design

Instrument development

This study adopted the measures that were developed in the literature. The measures were adapted to fit our study context while ensuring content validity. For face validity, face-to-face interviews with fifteen entrepreneurs were conducted to ensure the wording of measure items make sense to the participant as the construct definition. To have an initial evaluation of the measures, a pilot study in ten firms was also conducted. All constructs in the study were measured using items of a five-point Likert reflective scale, as summarized in the Appendix.
The measurement items for **external pressures** were adapted from the measure in Liang et al.’s (2007) study. These items examine the institutional pressures from partners, customers, and competitors for e-business applications. **IT infrastructure maturity** was operationalized as three items assessing the mature level of IT integration, compatibility, and modularity (Dong et al. 2009). These items capture the three most important types of IT infrastructure for supporting e-business application (Curley et al. 2013).

Since these three constructs of entrepreneurial perceptions are newly developed for this study, we developed items based on a literature analysis together with interviews of top managers. First, we used content analysis (Krippendorf 2004) and follow entrepreneurship literature (McMullen and Shepherd 2006; Kor et al. 2007) to identify the critical expressions of entrepreneurial perceptions. Then, we designed thirteen items and validated the expressions in Chinese e-business practices through discussions with fifteen senior managers. As a result, eleven items were retained and two were dropped. These eleven items were developed to measure entrepreneurs’ ability to understand collaborative experience, planning experience, and operational experience (see Appendix).

The construct of **e-business opportunity discovery** was operationalized using measures adapted from Müller et al.’s (2012) literature review, together with Chinese e-business practices. These items are related to the opportunities of information sharing, strategy support, IT-enabled integration, and tracking services (Müller et al. 2012).

Three control variables were included in the study to account for potential alternative explanations for e-business opportunity discovery. Due to variations in market dynamics, firms operating in different industries may face different levels of needs for opportunity discovery. Therefore, we used industry to control for the impact of industry on e-business opportunity discovery. Firm size has long been considered to be a factor that may affect firms’ strategic behaviors (Goode and Gregor 2009). Thus, we used the logarithm number of employees as a proxy for firm size to control for its effect on opportunity discovery. Also, entrepreneurs with more years of IT innovation job experience may be more capable of discovering e-business opportunities than entrepreneurs with less years of such experience. Thus, IT innovation job experience was measured as a control variable.

**Data collection and research sample**

As one of the largest emerging markets in the world, China provides an ideal setting for our research. To examine our research model, we collected survey data from firms in China, mainly in the manufacturing and service industries. To ensure the study sample well represents the population, we sought support from the Chinese Electronic Commerce Association (CECA)¹ and Chambers of Commerce from three main cities of e-business activities, including Suzhou (in eastern China), Guangzhou (in southern China), and Qingdao (in northern China). From above institutions, we obtained valid contact information of 650 sample companies, after removing 300 firms that are without valid contact information (e.g., invalid phone numbers, email, or fax). These firms well represent the e-business innovation in China. We followed the key informant approach to collect data from top managers in each firm who was highly knowledgeable about e-business opportunities. To ensure that the participants are capable of accurately answering the measurement items, we sent the survey only to CEO, president, vice president, general manager, or vice general manager. These top managers are appropriate respondents because they are usually recognized as main entrepreneurs in previous research (Wiklund and Shepherd 2003; Vaghely and Julien 2010).

All questionnaires were sent via interviews, mails or e-mails with a cover letter explaining the purpose of the research and the survey instructions. Within two weeks, follow-up emails or telephone calls were made to increase the response rate. The data collection process resulted in 218 responses. After eliminating 15 responses with too much missing data, usable responses from 203 firms resulted in a response rate of 33.5 percent. The sample size and response rate are reasonable and as expected when compared with prior IS research with samples of firms in China (Tan et al. 2007; Huang et al. 2009). Summary of the sample description is shown in Table 2. The percentage constitution of industries in the

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¹The Chinese Electronic Commerce Association is the premier association of e-business professionals in China with more than 60,000 members (http://www.ec.org.cn/Index.htm).
sample is very close to the percentage constitution in the 650 sample companies we obtained from CECA and three Chambers of Commerce.

<table>
<thead>
<tr>
<th>Employee</th>
<th>Count</th>
<th>Percentage</th>
<th>IT-related Job experience</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100</td>
<td>98</td>
<td>48.3%</td>
<td>&lt;=3 years</td>
<td>24</td>
<td>11.80%</td>
</tr>
<tr>
<td>101–500</td>
<td>41</td>
<td>20.2%</td>
<td>4-5 years</td>
<td>92</td>
<td>45.30%</td>
</tr>
<tr>
<td>501–1000</td>
<td>18</td>
<td>8.9%</td>
<td>7-8 years</td>
<td>74</td>
<td>36.50%</td>
</tr>
<tr>
<td>&gt;=1500</td>
<td>23</td>
<td>11.3%</td>
<td>&gt;=9 years</td>
<td>13</td>
<td>6.40%</td>
</tr>
<tr>
<td>Unknown</td>
<td>8</td>
<td>3.9%</td>
<td>Ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO</td>
<td>25</td>
<td>12.3%</td>
<td>State-owned</td>
<td>88</td>
<td>43.3%</td>
</tr>
<tr>
<td>President</td>
<td>9</td>
<td>4.4%</td>
<td>Private-owned</td>
<td>115</td>
<td>56.7%</td>
</tr>
<tr>
<td>Vice president</td>
<td>12</td>
<td>5.9%</td>
<td>Manufacturing</td>
<td>80</td>
<td>39.4%</td>
</tr>
<tr>
<td>General manager</td>
<td>109</td>
<td>53.7%</td>
<td>Service</td>
<td>123</td>
<td>60.6%</td>
</tr>
<tr>
<td>Vice general manager</td>
<td>48</td>
<td>23.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Assessment of common method bias**

Since the predictor and dependent variable data were collected from the same participant, it is necessary to assess the possibility of common methods bias in the results (Podsakoff et al. 2003). We adopted two methods to safeguard against and evaluate the presence of common method bias. Firstly, a Harman one-factor test (Podsakoff et al. 2003) was conducted on the seven conceptually crucial variables in our theoretical model. As expected, results show that a multifactor solution is a better fit than a single-factor model and suggest that common method bias is not a major concern. Secondly, following Liang et al (2007), we included in the PLS model a common method factor whose indicators included all the principal constructs’ indicators and calculated each indicator’s variances substantively explained by the principal construct and by the method. The results demonstrate that the average substantively explained variance of the indicators is 79%, while the average method based variance is 0.8%. The ratio of substantive variance to method variance is about 94:1. In addition, most method factor loadings are not significant. Given the small magnitude and insignificance of method variance, we contend that the method is unlikely to be a serious concern for this study.

**Research Results**

Partial least squares (PLS) was used to assess the measurement model and then to test the hypothesized structural model. This approach was chosen because of its minimal demands on residual distributions. Also, PLS is more appropriate for predicting the existence of causal relationships rather than validating the effect size (Chin et al. 2003). As the main interest of this study is to develop a theory that predicts e-business opportunity discovery, PLS is more appropriate.

**Measurement model**

First, an exploratory factor analysis (EFA) was conducted using SPSS 18.0 to validate the proposed factor structure. A principle component analysis with Varimax rotation was used to examine the factor structure of the measures. The resulting factor structure is as expected (KMO is above 0.8 with significant Bartlett’s test of sphericity at 0.05 levels). Six factors emerged with eigenvalue above 1.0 and explained a total of
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67% of the variance in the data. One item in collaborative experience perception (CP4) was deleted, due to its low factor loading.

Then, a confirmatory factor analysis (CFA) was conducted using Smart PLS V2.0. We assessed construct reliability, convergent validity, and discriminant validity. The measurement properties are reported in Table 3. Construct reliability assesses the degree to which items are free from random error and therefore yield consistent results. In the result, Cronbach’s alpha and composite reliability of all constructs were at least 0.72, which is higher the 0.7 normally considered threshold (Straub and Carlson 1989). Convergent validity assesses the consistency across multiple items. As shown in Table 3, all estimated standard loadings are significant (\(p<0.01\)), suggesting good convergent validity. Average variance extracted (AVE) was used assessed the discriminant validity—the extent to which different constructs diverge from one another. Table 4 shows square root of AVE for the constructs. Each of them has a squared root of AVE greater than 0.5 and higher than their correlations with any of the other constructs. According to Fornell and Larker (Fornell and Larcker 1981), this is consistent with the criteria needed to establish discriminant validity.

Table 3 Measurement Model: Factor Loadings, Reliability, and Convergent Validity

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Indicates</th>
<th>Loadings</th>
<th>T-value</th>
<th>C.R.</th>
<th>Cronbach (\alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Pressures (EP)</td>
<td>EP1</td>
<td>0.67</td>
<td>9.67**</td>
<td>0.78</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>EP2</td>
<td>0.75</td>
<td>44.29**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EP3</td>
<td>0.77</td>
<td>17.56**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Infrastructure Maturity (ITIM)</td>
<td>ITIM1</td>
<td>0.86</td>
<td>43.59**</td>
<td>0.87</td>
<td>0.78</td>
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<tr>
<td></td>
<td>ITIM2</td>
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<td>43.57**</td>
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<tr>
<td></td>
<td>ITIM3</td>
<td>0.84</td>
<td>53.12**</td>
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<tr>
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<td>72.15**</td>
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<td>CEP2</td>
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<td></td>
<td>CEP3</td>
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<td>27.62**</td>
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<td></td>
<td>PEP3</td>
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<td></td>
<td>PEP4</td>
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<td>34.73**</td>
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<td>Operational Experience Perception (OEP)</td>
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<td>26.84**</td>
<td>0.84</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>OEP2</td>
<td>0.82</td>
<td>32.53**</td>
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<tr>
<td></td>
<td>OEP3</td>
<td>0.80</td>
<td>27.56**</td>
<td></td>
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<tr>
<td>E-business Opportunity Discovery (EOD)</td>
<td>EOD1</td>
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<td>48.39**</td>
<td>0.86</td>
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<td></td>
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<tr>
<td></td>
<td>EOD4</td>
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<td>11.82**</td>
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Note: **\(p<0.01\)  
Table 4 Descriptive statistics, inter-construct correlations, and square root of AVE

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<tr>
<th>Constructs</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Industry</th>
<th>Firm Size</th>
<th>IT Job Exp.</th>
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<tr>
<td>1.EP</td>
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<td>Firm Size</td>
<td>IT Job Exp.</td>
</tr>
<tr>
<td>2.ITIM</td>
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<td>0.18*</td>
<td>0.83</td>
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<td></td>
<td></td>
<td></td>
<td>Industry</td>
<td>Firm Size</td>
<td>IT Job Exp.</td>
</tr>
<tr>
<td>3.CEP</td>
<td>4.12</td>
<td>0.62</td>
<td>0.25**</td>
<td>0.41**</td>
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<td>Firm Size</td>
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<td>4.PEP</td>
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<td>0.003</td>
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<td>0.14*</td>
<td>0.78</td>
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<td>Industry</td>
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<td>IT Job Exp.</td>
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<td>5.OEP</td>
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<td>1.8**</td>
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<td>6.EOD</td>
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<td>0.54**</td>
<td>0.38**</td>
<td>0.25**</td>
<td>0.31**</td>
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<td>Firm Size</td>
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</tr>
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<td>Industry*</td>
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<td>0.09</td>
<td>-0.07</td>
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<td>0.055</td>
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<td>0.02</td>
<td>0.19</td>
<td>0.03</td>
<td>0.17*</td>
<td>0.39**</td>
<td>Industry</td>
<td>Firm Size</td>
</tr>
<tr>
<td>IT Job Exp.</td>
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<td>2.28</td>
<td>0.05</td>
<td>0.21**</td>
<td>0.13</td>
<td>0.09</td>
<td>0.04</td>
<td>0.28**</td>
<td>0.03</td>
<td>0.26**</td>
<td>Industry</td>
</tr>
</tbody>
</table>

Note: *\(p<0.05\)  **\(p<0.01\). Bold diagonals represent the square root of AVE for multi-item scales. Dummy variables are used.
Entrepreneurial perceptions and e-business opportunities discovery

Structure model

The structural model was tested with the estimated path coefficients and their standard errors, along with the R² value, which reflects the variance explained by the model. A bootstrap resembling procedure of 500 resamples was used to test the statistical significance of the parameter estimates. The results are shown in Figure 2. The model explained 26.1% of variances in e-business opportunities discovery, of which the control variables explained 3.1%.

![Figure 2. Research Results](image)

Note: *** p < 0.001, ** p < 0.01, * p < 0.05, NS p > 0.05

For control variables, firm size (β=0.08, p<0.05) positively and significantly impacts e-business opportunities discovery, which suggests that larger firms normally have better capability of discovering e-business opportunities than smaller firms. IT-related experience also significantly increases e-business opportunity discovery (β=0.19, p<0.01). This result indicates that firms with more years of IT-related experience is more likely to discover e-business opportunities, probably because of their sophisticated knowledge and capability for e-business innovation.

The results support hypotheses H1a, H1b, and H1c. Collaborative experience perception (β=0.28, p<0.001), planning experience perception (β=0.18, p<0.001), and operational experience perception (β=0.14, p<0.01) have positive and significant effect on e-business opportunity discovery. Firms with a high degree of entrepreneurial perceptions tend to show a high level of e-business opportunity discovery. Hypotheses H2a, H2b, and H2c are all supported at a pretty strong 0.001 significance level, demonstrating that external pressures lead to improved collaborative experience perception (β=0.17, p<0.001), planning experience perception (β=0.14, p<0.001), and operational experience perception (β=0.36, p<0.001). H3a and H3b are supported and H3c is not supported. IT infrastructure maturity has a positive and significant effect on collaborative experience perception (β=0.37, p<0.001) and planning experience perception (β=0.39, p<0.001), but it does not have a significant impact on operational experience perception.

Post hoc analysis

While we did not propose mediation effects in the hypotheses, to further check the robustness of our research results, we conducted a mediation test of entrepreneurial perceptions in discovery procedure for e-business opportunities. We used the procedure suggested by Baron and Kenny to test mediation effects (Baron and Kenney 1986). We first ran separate models between independent variables and mediators, between mediators and dependent variables, and between independent variables and dependent variables.
We then ran a full model to test for the effects between independent variables and dependent variables after controlling for the mediation variables. The level of significance was assessed using a Sobel test.

As shown in Table 5, the Sobel mediation test statistic had a significant value \((p<0.05)\), providing evidence that the three entrepreneurial perceptions partially mediate the relationships between external pressures and e-business opportunity discovery. Furthermore, we observed that two of three entrepreneurial perceptions (i.e., collaborative experience perception and planning experience perception) partially mediate the relationship between IT infrastructure maturity and e-business opportunity discovery.

### Table 5 Sobel mediation test

<table>
<thead>
<tr>
<th>IV</th>
<th>MV</th>
<th>DV</th>
<th>IV→MV(a)</th>
<th>MV→DV(b)</th>
<th>IV→DV (c')</th>
<th>Sobel Z test</th>
<th>Mediation Type</th>
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<tbody>
<tr>
<td>EP</td>
<td>CEP</td>
<td>EOD</td>
<td>0.17***</td>
<td>0.28***</td>
<td>0.19**</td>
<td>2.12*</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>PEP</td>
<td>EOD</td>
<td>0.14***</td>
<td>0.18***</td>
<td></td>
<td>1.99*</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>OEP</td>
<td>EOD</td>
<td>0.36***</td>
<td>0.14**</td>
<td></td>
<td>2.31*</td>
<td>Partial</td>
</tr>
<tr>
<td>ITIM</td>
<td>CEP</td>
<td>EOD</td>
<td>0.37***</td>
<td>0.28***</td>
<td>0.21***</td>
<td>2.24*</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>PEP</td>
<td>EOD</td>
<td>0.39***</td>
<td>0.18***</td>
<td></td>
<td>2.10*</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>OEP</td>
<td>EOD</td>
<td>0.01 NS</td>
<td>0.14*</td>
<td></td>
<td>---</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: IV : independent variable; MV: mediation variable; DV: dependent variable.

*** \(p<0.001\); ** \(p<0.01\); * \(p<0.05\); NS: Non-significant

\(a Z = ab / \sqrt{a^2 S_a^2 + b^2 S_b^2 + S_c^2} \), \(a\) is the path coefficient of path from IV to MV, \(b\) is the path coefficient of path from MV to DV, and \(S_a^2\) and \(S_b^2\) are the corresponding standard deviations.

### Discussions and Implications

#### Contributions

Despite that some studies have investigated entrepreneurial opportunity discovery (Wiklund and Shepherd 2003; Kor et al. 2007), little empirical works have been done to examined e-business opportunities discovery. In this study, we introduced the subjectivist theory of entrepreneurship into e-business research context and examined entrepreneurial discovery procedure for e-business opportunities. Empirical evidence from traditional firms in China generally validated the causal relationships in the discovery procedure of e-business opportunities. Our study contributes to the literature by explaining how driving forces, i.e., external pressures and IT infrastructure maturity, promote e-business opportunity discovery, mediated by entrepreneurial perceptions. Specifically, this study contributes to the IS entrepreneurship literature in the following three ways.

Firstly, this study identifies the role of external pressures and IT infrastructure maturity in opportunity discovery. The findings suggest that external pressures and IT infrastructure maturity activate entrepreneurial perceptions in the e-business opportunity discovery procedure. Although STE suggests that entrepreneurial discovery takes place as entrepreneurs seek opportunities afforded by environment dynamics, and accumulated organizational resources (Smith and Gregorio 2002; Siegel and Renko 2012), little empirical effort has been undertaken to support this statement. Our research model integrated the literature of institutional pressures (DiMaggio and Powell 1983; Teo et al. 2003) and the resource-based view (Barney 1991) to examine how external pressures and IT infrastructure maturity shape the entrepreneurial experiences perceptions in seeking e-business opportunities of a firm. This finding contributes to the IT and strategic management literature for suggesting driving forces of the discovery of IT-related entrepreneurial opportunities.

Furthermore, our results show that the two driving forces in our study, external pressures and IT infrastructure maturity, can affect the three entrepreneurial perceptions differently. Specifically, the effects of IT infrastructure maturity are much stronger than external pressures on entrepreneurial perceptions of collaborative experience and planning experience. These findings suggest that firms in China are influenced more by organizational resources than external pressures to strengthen collaborative experience perceptions and planning experience perceptions. In addition, while external pressures have a
positive and significant effect on operational experience perceptions, IT infrastructure maturity doesn’t have a significant influence on operational experience perceptions. This result shows that partners, customers, and competitors pose pressures so that firms endeavor to understand operational experience of e-business. Through the understanding the differential impacts of external pressures and internal IT infrastructure maturity on types of entrepreneurial perceptions, firms endeavor to understand their experience better, which later lead to the discovery of e-business opportunities.

Finally, our third contribution regards the mediation role of entrepreneurial perceptions in the procedure of e-business opportunity discovery. The result suggests that the whole procedure of e-business opportunity discovery, from external pressures and IT infrastructure maturity to e-business opportunity discovery, is partially mediated by entrepreneurial perceptions. Such finding reveals both significant direct and indirect effect (through entrepreneurial perceptions) of external pressures and IT infrastructure maturity on e-business opportunity discovery. The literature has suggested entrepreneurial perceptions as the critical triggers for e-business adoption when the firm encounters intense market pressures (Grandon and Pearson 2004). The finding further provides evidence about the role of entrepreneurial perceptions and how entrepreneurial perceptions influence opportunity discovery. Our research explains how entrepreneurial perceptions can make external pressures and IT infrastructure maturity become a source of firm’s e-business opportunity. Moreover, from the result we argue that collaborative experience perception and planning experiences perception would be more important than operational experiences perception in the procedure of e-business opportunity discovery. This finding indicates that a firm’s understanding of its experience regarding organizational relationship management and e-business planning serves a critical role in converting external pressures and IT infrastructure maturity into e-business opportunity discovery.

**Implications**

Our study have two major implications for business practice. First, our study provides a framework for entrepreneurs to understand how to discover e-business opportunities, as well as the importance of improving their understanding of e-business applications in business practices. Second, in pursuing new e-business opportunities, entrepreneurs should view both external pressures and IT infrastructure as external and internal driving forces for motivating entrepreneurial perceptions. Our findings motivate entrepreneurs to enhance perceptions about collaborative, planning and operational experience accumulation. This finding provides valuable guidance for entrepreneurs to understand the procedure to discover e-business opportunities.

**Limitations and further research**

The limitations of this study are as follows. First, our sample data were collected from China. China’s transition economy may have unique features, different from other developing countries and the market economy in general. Therefore, future studies could adopt measures to further generalize the findings to other countries and economies, such as adding institutional framework (Meyer et al. 2009), and country culture (Leidner and Kayworth 2006). Second, although our sample size of 203 samples and response rate are reasonable when compared with prior IS research, future research could collect more data so as to compare e-business opportunity discovery due to different types of external pressures. Finally, the research model explained 26% of variance in the dependent variable and thus there are some other factors that have not been considered in the model. For example, entrepreneurs’ decision making style (i.e., adventure vs. conservation) (Martinsons and Davison 2007) may play a moderating effect on entrepreneurial perceptions.

**Conclusion**

E-business has become a strategic opportunity for driving digital business transactions, offering emerging service and promoting economic development. Our empirical study contributes to the subjectivist theory of entrepreneurship by extending its application to examine the discovery procedure of e-business opportunities. This study highlights the importance of external pressures, IT infrastructure maturity, and entrepreneurial perceptions on e-business opportunity discovery. Entrepreneurs should pay more
attention to the role of entrepreneurial perceptions, specifically the perception of collaborative experience, planning experience, and operational experience, in the discovery of e-business procedures.

Acknowledgements

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Appendix - Survey items

1. For each of the following items, please evaluate according to your perceptions:

   **External Pressures (EP)**
   Please indicate
   1- Very low; 5- Very high
   EP1. The extent of pressures from our partners’ influence in the e-business environment
   EP2. The extent of pressures from our customers’ influence in the e-business environment
   EP3. The extent of pressures from our competitors’ influence in the e-business environment

   **IT Infrastructure Maturity (ITIM)**
   Please indicate
   1- Strongly disagree; 5-Strongly agree
   ITIM1. Our IT infrastructure can be fully integrated with back-office systems and databases.
   ITIM2. Our IT infrastructure can be compatible with our partners to transmit, integrate and process data.
   ITIM3. Our IT infrastructure consists of modular software components to support reuse in other business applications.

   **Collaborative Experience Perception (CEP)**
   Please indicate
   1- Strongly disagree; 5-Strongly agree
   CP1. I believe we have experience to build trust-based relationship between our firm and partners.
   CP2. I believe we have experience to establish long-term collaborative goals between our firm and partners.
   CP3. I believe we have experience to build equal collaboration mechanisms between our firm and partners.
   CP4. I believe we have experience to establish policies to realize business privacy preservation. (Deteled in EFA)

   **Planning Experience Perception (PEP)**
   Please indicate
   1- Strongly disagree; 5-Strongly agree
   PEP1. I believe our management team has knowledge to improve e-business strategic vision.
   PEP2. I believe our management team has experience to established explicit goals to develop e-business.
   PEP3. I believe our management team has experience to initiate team management for strategic transformation.
   PEP4. I believe our management team has experience to align our IT strategy with business strategy.

   **Operational Experience Perception (OEP)**
   Please indicate
   1- Strongly disagree; 5-Strongly agree
   OEP1. I believe our firm has good technical operational experience for supporting e-business
   OEP2. I believe our firm has good management operational experience for supporting e-business
   OEP3. I believe our firm has good collaborative working experience for supporting e-business

2. How do you evaluate your firm's potential e-business opportunities?

   **E-business Opportunities Discovery (EBOD)**
   Please indicate
   1-To no extent; 3-To some extent; 5-to a great extent
   EBOD1. I understand our firm’s potential opportunities of improving business innovation through sharing operational data and knowledge
   EBOD2. I understand our firm’s potential opportunities of advancing digital strategy in exploring new market.
   EBOD3. I understand our firm’s potential opportunities of realizing digital collaboration through IT-enabled integration with our partners.
   EBOD4. I understand our firm’s potential opportunities of promoting market agility through tracking customers’ requirements.
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References


Huang, G. "SCM integration and innovation in full channel business model," 2014.


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