An Empirical Study of E-Business Implementation Process in China

Jing Zhao, Wilfred Vincent Huang, and Zhen Zhu

Abstract—E-business successes in traditional organizations have prompted much interest among researchers in many disciplines such as strategic management, information systems, and economics. However, the complexity of e-business implementation process has been overlooked, and it remains unclear. This paper investigates causal relationships among strategic initiative, information technology (IT)-related resources, and e-business capabilities; and their roles in the implementation process. From the resource-based view (RBV) of a firm and e-business strategic standpoint, we propose a model of e-business implementation process. We divide the process into four stages, and 11 hypotheses are developed in seeking relationships among six proposed constructs. Drawing from a sample of 56 enterprises within Hubei Province in China, we provide theoretical support for a critical causal link from e-business strategy on implementation and performance [11], while others stress on resources and capability in generating e-business value using resource-based view (RBV) of the firm [3]. Prior works lack research on these causal relationships forming the linkage and impacting the implementation process, making it incomplete and unclear; consequently, the fundamental elements of e-business process are not well understood. Our research is motivated by a desire to understand how and what relationships interact in e-business implementation process leading to organizational transformation.

I. INTRODUCTION

MANY traditional organizations have undertaken major initiatives to leverage the Internet by transforming their value activities with customers, suppliers, and other business partners with the objective of improving firm performance [3]. Electronic business (e-business), viewed here as the business activities conducted over the Internet, continues to penetrate the enterprise value chains [56]. In this environment, resources can be combined and integrated into unique functionalities that enable distinctive capabilities within a firm [46], which cannot be substituted for or easily imitated (such as shared information). A firm benefits from the Internet when they embed e-business capability into their organizational fabric in a way that produces resource complementarity [56]. However, e-business initiation does not ensure super performance, because converting resources into capabilities in the implementation process will bring challenges in transformation of an organization. In the past, over 70% of such initiatives have either failed totally or failed to meet expectations [47]. Yet, implementation process complexity has been overlooked. Information technologies not only differ with respect to their intrinsic characteristics, but also in how they are implemented and become available for utilization by the organization [32]. Throughout the implementation, IT resources, business process alignment, and partner readiness can be combined to creating e-business capabilities that have a positive impact on operational and financial performance [3], [14]. The literature is scarce on studies of the dynamic process of practical e-business implementation for enterprises [30], [33]. Related studies have been developed in two directions. Some stress on positive effects of e-business strategy on implementation and performance [11], while others stress on resources and capability in generating e-business value using resource-based view (RBV) of the firm [3]. Prior works lack research on these causal relationships forming the linkage and impacting the implementation process, making it incomplete and unclear; consequently, the fundamental elements of e-business process are not well understood. Our research is motivated by a desire to understand how and what relationships interact in e-business implementation process leading to organizational transformation.

The objective of this paper is to investigate the existence of causal relationship among strategy, resources, and capabilities through conceptualizing e-business implementation process. We explore the reasoning and mechanism underlying successful e-business implementation. From the RBV and the e-business strategy perspectives, we propose a model of e-business implementation process and identify the relevant three dimensions [e-business strategy, information technology (IT)-related resources, and e-business capabilities] and six constructs (strategic initiative, information systems, partner e-readiness, IT human resources, information sharing capabilities (ISCs), and collaborative process capabilities (CPCs)) that could explain e-business initiative and subsequent development. We divide the implementation process into four stages: 1) e-business strategic planning; 2) integrative use of IT-related resources; 3) generation of ISCs; and 4) generation of CPCs. In our empirical study, we find: 1) the causal relationships among strategy, resources, and e-business capabilities existed in the implementation process; 2) the role of strategy in utilizing IT-related resources and creating e-business
capabilities; 3) the significant intermediate effect of ISCs on converting IT-related resource into CPCs.

This paper is organized into seven sections. The literatures are briefly reviewed in Section II, and the proposed model and hypotheses are presented in Section III. We validate the model using structural equation modeling (SEM) with data collected from 56 enterprises in Hubei Province of China. The empirical methodology and data analysis are separately described in Section IV and Section V. Research findings along with a few examples of firm’s e-business implementation are discussed in Section VI. Finally, the theoretical contributions and practical implications are presented in Section VII, and the limitations of the study are outlined with suggestions for further research.

II. LITERATURE REVIEW

Researchers have tried to characterize and explain the roles played by e-business strategy, resource, and capabilities in organizational transformation. One route is in the study of the process of e-business value creation from RBV. Another route is in the study of the roles played by e-business strategy.

A. Relationship Between Resources and E-Business Capabilities From RBV

The RBV, a dominant theory in the strategic management literature, asserts that firms gain and sustain competitive advantages by deploying valuable resources and capabilities that are inelastic in supply [2], [53]. Information systems (IS) researchers have also begun to employ the resource perspective to expand and deepen our understanding of IT business value [4], [38], [41]. Recent studies using RBV as a theoretical base have focused on the relationships between resources and e-business capabilities and e-business value creation. From RBV, a firm’s overall e-commerce effectiveness is determined by its investment in IT and e-commerce for creating unique Internet-enabled capabilities. By linking firm’s performance to organizational resources and capabilities [56], RBV provides a valuable approach to empirical study of the process of e-business value creation.

Barua et al. [3] study firms’ abilities to deploy three resources—IT, processes, and readiness of customers and suppliers—to create business value. Their empirical result with survey data from over a thousand firms showed that online informational capabilities have a positive impact on operational and financial performance. With empirical result in the retail industry, Zhu [56] finds that e-commerce capability and IT infrastructure (an IT resource) exhibit positive relationships to firm’s performance measures. He addresses that positioning e-commerce to leverage other complementary resources such as IT infrastructure and connectivity with suppliers should be a priority for managers. Wade and Halland [49] address the difference between resources and capabilities of a firm in detecting and responding to market opportunities or threats. Some resources—particularly certain IT assets—are easily available (e.g., IT hardware, the Internet, etc.) or transferable (e.g., patents) compared with capabilities (e.g., market responsiveness, managing external relationships) that are firm-specific and deeply embedded within an organization and its processes that are not easily transferable.

B. E-Business Strategy

E-business strategy literature focuses on strategic initiatives and strategy implementation and performance. Most of them rely heavily on case studies and conceptual frameworks, with few empirical data to characterize e-business strategic initiatives or gauge the scale of their impact on firm’s performance—especially in large, traditional companies.

1) E-Business Strategic Initiatives: Changa et al. [11] propose that e-commerce initiatives are important strategic initiatives and that firms with a stronger e-commerce market orientation will be more successful. Content analysis of letters from CEO to shareholders of 145 Fortune 500 firms indicate that e-commerce must be pursued carefully as a strategic initiative rather than as an appendage to an existing organization. Their research suggests that the more a firm perceives e-commerce as being important (as reflected in corporate strategy), the more likely it will have a higher level of operating efficiency and profitability compared to those firms with a lower perception of importance. In other words, failure to recognize e-commerce as a part of corporate strategy is more likely to result in isolated initiatives or responses to competitive pressures that are less likely to leverage full complement of organizational resources.

2) E-Business Strategy Implementation and Performance: Porter [36] argues that enterprise should focus on positioning and implementation of e-business strategy effectively to activate internal resources that are rare and valuable. Molla and Licker [31] argue that organizational factors especially the human, business, and technological resources and awareness are more influential than are environmental factors in the initial adoption of e-business. Paper et al. [33] construct a preliminary model of small-medium-sized enterprise (SME) e-commerce process from in-depth interviews with 15 successful e-commerce entrepreneurs. It reports that the first cause of SME e-commerce failure today is the lack of fundamental understanding in capabilities and limitations of conducting business electronically.

Grandon and Pearson [17] examine the determinant factors of strategic value and adoption of e-commerce as perceived by top managers in SME in the Midwest region of the USA. They identify four factors that influence e-commerce adoption: organizational readiness, external pressure, perceived ease of use, and perceived usefulness. From the canonical analysis of link between perceptions of strategic value and adoption, it can be concluded that managers with positive attitude toward e-commerce adoption recognize e-commerce as adding strategic value to the firm.

C. Related Research in Different Countries

We review literature on e-business development in different countries among major management journals and working papers of Penn State’s, MIT’s, and McMaster’s e-business research centers within recent five years.
Fig. 1. E-business implementation process model.

1) China: Strategic alliance is especially critical for local firms with regard to their e-business successes. In a case study of Haier in China, Li and Chang [26] address that all firms need to learn how to design effective e-business strategies. The case also suggests that local firms from developing countries need to be creative in formulating e-business strategies so as to operate effectively in the underdeveloped e-business environment. Haier is creative in developing its own unique e-business model in a trial-and-error process. Investigating the effect of product innovation strategy on the performance of new technology ventures in China, Li and Gima [25] examine the contingent relationship between product innovation strategy and new technology venture performance. They report that, given the inadequate institutional infrastructure in China’s transitional economy and the new ventures’ limited resources, support from government institutions plays a significant role in enhancing the effectiveness of new technology ventures’ product innovation strategy.

2) Developing Countries and Developed Countries: Molla and Licker [31] construct and empirically test a model of e-commerce adoption in developing countries with a survey of 150 businesses from South Africa. They argue that organizational factors especially human, business, and technological resources, and awareness are more influential than environmental factors in the initial adoption of e-commerce. Gregorio et al. [18] study the determinants of e-business activity across a sample of 26 developed countries and 52 emerging markets. They find that the level of e-business activity taking place within a given country is dependent upon the country’s information and communication technology (ICT) infrastructure, human capital, and logistics/fulfillment infrastructure. It is important for managers and entrepreneurs to understand the conditions that enable e-business activity in both developed and emerging markets.

D. Integration of Theories and Relationship to This Research

Although prior works have substantially contributed to our understanding of the role of resources and capability in the process of e-business value creation from RBV and the factors impacting e-business strategy initiation and implementation, we believe they are incomplete and unclear in e-business strategy implementation process based on two independent standpoints. One is focusing on resources and capability without considering the role of strategy, and the other is focusing on e-business strategy without considering the role of resources and capability. The existing works lack the gestalt perspective when implementation is to be studied. This implementation process contains a dynamic link between strategy, resources, and capability, realizing the organizational transformation. This paper takes a first step toward exploring the causal relationships.

III. RESEARCH MODEL AND HYPOTHESES

In this section, we present our e-business implementation process model. We use RBV along with e-business strategy views to derive our hypotheses, so as to test the causal relationships between constructs.

A. The Model for E-Business Implementation Process

We characterize our model with three dimensions and six constructs relating to e-business strategy implementation. As shown in Fig. 1, the six constructs are strategic initiative, information systems, partner e-readiness, IT human resources, information sharing capabilities (ISCs), and collaborative process capabilities (CPCs). The model describes and recognizes the effect of strategic initiative on deploying and utilizing IT-related resources for creating e-business capabilities and the causal relationships. This leads to a better understanding of the underlying mechanisms in e-business implementation process of the firm. In the model, ISCs and CPCs are conceptualized as new type of e-business capabilities to improve organizational performance. They are viewed as significant indicators for successful e-business strategic implementation.

B. Strategic Initiative

The e-business strategic initiative is defined here as strategic orientation and planning to direct utilization and integration of organizational resources for e-business performance. Based on the views of strategic decision aids and strategic value [17], awareness of top managers [6], senior leadership knowledge [1] and strategy implementation [34], strategic initiative stresses on three factors of the organization: top managers’ attitude and commitment, IT infrastructure, and internal funds. We next explain briefly the three strategic initiative variables.

1) Attitude and Commitment: Attitude and commitment refer to the vision and commitment of the entrepreneur to the
C. IT-Related Resources Variables

The IT-related resource variables refer to Barney’s [2] classification of firm’s resources with IT utilization. They are information systems, IT human resources, and partner e-readiness, as similar findings by Bharadwaj [4] and Melville [30].

1) Information Systems: We define information systems as the computerized business applications supporting e-business process. Weill and Broadbent [52] identify that technological IT resource can be further categorized into: 1) IT infrastructure and 2) specific business applications that utilize the infrastructure. Tan et al. [45] suggest that by enabling more open communication systems, Internet has increased the cost-effective flow of information and that markets reflect perfect information, and thus, enable more efficient resource allocation. So in an e-commerce setting with open information systems, the term refers to the components of integrated enterprises applications such as enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), etc.

2) IT Human Resources: IT human resources are defined as a firm’s integrated intangible IT and management knowledge-base resources. Such resources require particular skill and knowledge in implementing digitized business processes. IT human resources also take part in deploying, using, and managing IT resources within enterprises. Access to skilful personnel is one of the keys for successful e-business [30].

3) Partner E-Readiness: Partner e-readiness is defined as the degree to which a firm’s partners are willing and ready to conduct business activities electronically. The definition is similar to partner readiness presented by Barua et al. [3], Melville et al. [30] point out that information technology increasingly permeates organizational boundaries, linking multiple firms via electronic networks and software applications, and melding their business processes. As a result, trading partners increasingly impact the generation of IT business value. So, the strength and urgency of these e-readiness situations must, therefore, also be examined for their potential impact on the company. Here, partner e-readiness mainly consists of industry and network e-readiness (such as international partners) and supply chain e-readiness (such as customers and suppliers).

D. E-Business Capabilities

E-business capability contains two types of higher order capabilities: ISC and CPCs. The impacts of both capabilities on the firm’s organizational performance and value creation have been investigated and verified by some researchers [3], [56].

1) Information Sharing Capabilities: ISC are defined as the ability that the enterprise uses Internet technology to share strategic and tactical information with customers and external partners such as suppliers or dealers. The definition is similar to online informational capabilities presented by Barua et al. [3]. Many researches refer to sharing information, such as net-enabled business value [3], supply chain management [27], buyer-supplier relationships [20], and information systems [58]. Barua et al. [3] clarify that online informational capabilities enable firms to improve on all types of interactions with customers and suppliers, which, in turn, have a positive impact on operational and financial performance. Lin et al. [27] discover that the more detailed the information shared between firms, the lower the total cost. In addition, the deeper the information sharing level, the higher in-time order fulfillment rate and the shorter order cycle time, as information sharing may reduce the demand uncertainty that firms normally encounter.

2) Collaborative Process Capabilities: CPCs are defined as the ability of a firm to accomplish collaborative business processes electronically with their partners. It covers internal business processes as well as processes that involve interaction with customers and suppliers. From RBV perspective, business processes provide a context within which to examine the locus of direct resource exploitation. A single firm executes numerous business processes to achieve its strategic objectives, thereby providing a range of opportunities for the application of IT to improve processes and organizational performance [37]. According to empirical result, Barua et al. [3] note that higher level of business process digitization indicates that a firm can better coordinate procurement processes and material movement that reduces inventory, obsolescence, and transportation costs. CPCs reflect the effective application of the e-business systems not only to support the regular value-chain activities within the firm, but also to enhance relationships with customers and suppliers [40].

E. Model Hypotheses

In order to study in depth the causal relationships between constructs in e-business implementation process, we divide the process into four stages: e-business strategic planning, integrative use of IT-related resources, generation of ISC, and generation of CPC. A series of hypotheses are developed to test the relationships between constructs.
1) **E-Business Strategic Planning:** In this stage, strategic initiative is associated with three factors: top manager’s attitude and commitment, IT infrastructure, and internal funds. Typical views supporting them are as follows.

Grandon and Pearson [17] reveal a significant relationship between the perceived strategic value of e-commerce variables and the factors that influence e-commerce adoption in SMEs. This means that top managers who perceive e-business as adding strategic value to the firm have a positive attitude toward its adoption. It is important that entrepreneurs and/or key managers are fully convinced of its strategic relevance to their plans and are committed to the implementation of the necessary aspects of e-business in their enterprise [29]. Theoretically, literature from RBV regards IT infrastructure as a strategic option. The construction of IT infrastructure is a precondition of e-business planning initiative. Internal funds are critical in affecting e-business strategic option because, most of the time, traditional enterprises do not have sufficient IT investment in China. Tallon et al. [44] measure IT payoffs through perceptual measures and argue that executives rely on their perceptions in determining whether a particular IT investment creates value for the firm.

Therefore, we focus on the relationships between strategic initiative and each factor, which influence the level of strategic initiative. Hence, we hypothesize the following.

- **H1a:** Successful strategic initiative will be positively associated with top manager’s attitude and commitment.
- **H1b:** Successful strategic initiative will be positively associated with IT infrastructure.
- **H1c:** Successful strategic initiative will be positively associated with internal funds.

2) **Integrative Use of IT-Related Resources:** In this stage, successful strategic initiative leads to plan and use effectively two types of IT-related resources—information systems and IT human resources. Literature from RBV provides robust framework explaining how IT helps firms gain business value by treating certain IT and IT-related resources (e.g., IT skills, IT human resources, IT knowledge) as rare and valuable [3], [30]. The importance of utilization of IT resources, particularly with business strategy, has been well documented. This utilization has variously been referred to as synergy [4], assimilation [58], and partnership [39]. According to Zhu [56], the integration of resources is a feasible path to e-business value. From e-business strategy view, planning and managing such systems require an integrated multidimensional resources and perspectives across the technology and business to develop new business process management [42]. Centola et al. [8] remark the important role of appropriate allocation of resources and budget in preparing the internal infrastructure, such as people, systems, and process to support the collaborative commerce.

In summary, we emphasize that the relationships between strategic initiative and IT-related resources (covers information systems and IT human resources), which influence the level of utilization of IT-related resources. Therefore, the following relationships are hypothesized.

- **H2a:** Higher levels of strategic initiative will be positively associated with IT human resources.
- **H2b:** Higher levels of strategic initiative will be positively associated with information systems.

3) **Generation of Information Sharing Capabilities:** In this stage, generation of ISCs is related to strategic initiative and IT-related resource including information systems, IT human resources, and partner e-readiness. Literature from RBV and e-business strategy supporting the relationship are as follows.

- **a) ISCs and Strategic Initiative:** IT capabilities are bundles of internally consistent elements fulfilling business strategic objectives [22]. Without such focus on capability, the organization may make IT expenditures in a fragmented manner. If a firm develops IT capabilities for specific business goals, it is far more likely to be able to effectively employ the resources to impact profitability. Most senior managers and business owners understand that sharing information externally and internally can advance customer relationships and increase process efficiencies, such as in supply chain management and collaborative commerce [8], [27]. It is noted that the role of strategic initiative is important in the generation of information sharing capabilities.

- **b) ISCs and Information Systems:** Internet provides a nearly ubiquitous platform for information sharing between different organizational systems. Increasing information flow in the supply chain can alter the market. For an organization with a high level of information systems, it should be able to transmit, combine, and process data from business partners, such as customers and suppliers/vendors. Its integrated external and internal systems are able to monitor order status at various stages in the process and automatically reflect order changes in downstream processes or systems [24]. Further, it needs to easily share data among various internal systems and to retrieve information from various databases for decision support [43].

- **c) ISCs and IT Human Resources:** Human IT expertise complementary to technological IT resources may create temporary competitive advantages that distinguish performance differences among firms. Bharadwaj [4] addresses that firms with strong human IT resource are able to communicate and work with business units more efficiently.

- **d) ISCs and Partner E-Readiness:** The e-readiness of all partners in the value chain allows information flow to reduce information asymmetry and uncertainty, while enhancing coordination. Barua et al. [3] show empirically that successful net-enabled business transformation (NBT) of a firm depends not only on its own efforts to incorporate IT in its operations, but also on the readiness of its customers, suppliers, and trading partners to engage in electronic interactions and transaction. So far in China, the external environment for e-business is not adequate. For example, the legislation is incomplete, and not all partners in the supply chain are ready for e-business. Enterprises implementing such initiatives need to analyze external forces [11].

After summarizing all literature collected, the causal relationships among strategic initiative and three IT-related resources and ISCs explain the transfer process from strategy to resources.
and to generation of information sharing capabilities. Therefore, the following relationships are hypothesized.

\textbf{H3a:} Strategic initiative will be positively associated with information sharing capabilities.

\textbf{H3b:} Information systems will be positively associated with information sharing capabilities.

\textbf{H3c:} IT human resources will be positively associated with information sharing capabilities.

\textbf{H3d:} Partner e-readiness will be positively associated with information sharing capabilities.

4) \textbf{Generation of Collaborative Process Capabilities:} In this stage, IT human resources and ISCs are associated with the CPCs. More open and information sharing are found to lead to positive effects on interfirm relationship to create effective collaborative processes [9]. In fact, systematically sharing information reduces operational performance risk because it makes processes easier to monitor by substituting information for inventory and excess resources. From knowledge management perspective, Thuraisingham \textit{et al.} [48] highlight that while e-business enables business transactions to be performed on the Web, one needs effective knowledge management and collaboration techniques for organizations to work across organizational boundaries. It means sharing expertise, developing a learning organization, teaching the staff, learning from experiences, as well as collaboration.

The relationship among CPCs, ISCs, and IT human resources reveals a special "IT-related resources and e-business capabilities" bundle, which directly affects the generation of the CPCs. Therefore, the following relationships are hypothesized.

\textbf{H4a:} Information sharing capabilities will be positively associated with CPCs.

\textbf{H4b:} IT human resources will be positively associated with CPCs.

\section*{IV. RESEARCH METHOD}

\subsection*{A. E-business Status in China}

E-business in China began with the deployment of electronic data interchange (EDI) during the 1990s, and has shifted to Internet-based mode of operation in 1998. More than 20 million computers tabbed on the Web, yielding a total output bandwidth of 9.38G. China ranked fifth in the number of Internet users in 2002, and this number was 100 million in 2005 [12]. After the entry to WTO, it is expected that more enterprises in China will adopt e-business responding to the opening of the market. It is also likely that China will become the fastest growing market of e-business. Today, China has 15,000 medium-to-large-sized enterprises and 10 million SMEs. It is predicted that over 70\% of enterprises in foreign trade will adopt e-business for international trading [54].

Nonetheless, e-business in China is just in its infancy. E-business adoption has been constrained by the quality, availability, and cost of IT infrastructure. In addition, most businesses are small. Inadequate resources and capabilities can facilitate e-business adoption, but not to a successful e-business implementation. Hence, human, technological, and business resources of an enterprise need to be considered in making adoption decisions in business practice [28]. Success depends on making changes in organizational structure, firm’s resources, and business processes in developing countries [6].

\subsection*{B. Sample Choice}

The e-business adoption by enterprises in different provinces of China depends largely on the current industry structure, IT infrastructure, and organizational structure [55]. Current e-business developments in China show that inshore area is better than central area, and that central area is better than the western area. Hubei province is one of the economic, cultural, and educational hubs of central China. We chose Hubei enterprises in our research for the following three reasons.

First, Hubei province lies in the center of China, and is a flourishing area with traditional business that can reflect characteristics of China’s e-business development in traditional enterprises. Second, most of the businesses in Hubei province recognize economic potential of e-business and support willingly or plan to develop e-business. Third, provincial government is setting the pertinent law and regulatory systems accordingly, and is proposing for improvement of the network infrastructure, e-education, network security issues, e-government, e-business, and preparation of IT workforce to support developing e-business.

\subsection*{C. Subjects and Instrument}

We consider e-business adoption as principal criterion in determining whether a firm is qualified as a sample. Our target respondents in firms are information systems department managers or top managers. In our study, enterprises selected are in manufacturing, foreign trade, and services sectors. We believe enterprises with larger export volume will pay attention to their e-business development, and the ranking enterprises can represent the informatization development in their industries. It has provided us a good representation of studying e-business practice in China by including these enterprises in our sample.

We used a questionnaire of 37 questions with a Likert scale of five points (from best adoption to none) to answer each question (see the Appendix). This questionnaire is used to measure the level of adoption of e-business practices in developing counties that was designed by the International Trade Center (ITC) of the United Nations Conference on Trade and Development (UNCTAD)/World Trade Organization (WTO) (http://www.intracen.org).

\subsection*{D. Data Collection}

The Commerce Department of Hubei province and the Foreign Trade Bureau of Wuhan city provided us with a list of enterprises. Through phone calls, facsimiles, interviews, and e-mails, we distributed our questionnaire surveys and face-to-face personal interviews in March and May 2004. During the whole process, we have sent out surveys to 196 enterprises and received 59 back. Three responses had too many missing data and were discarded. The usable responses were 56 and the usable response rate was 28.8\%. Compared to previous similar studies in IS literature [50], the response rate in our study is acceptable.
TABLE I  
SUMMARY OF ENTERPRISES IN THE SAMPLE

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>45</td>
<td>80.35</td>
</tr>
<tr>
<td>Foreign Trade</td>
<td>8</td>
<td>14.28</td>
</tr>
<tr>
<td>Services</td>
<td>3</td>
<td>5.35</td>
</tr>
<tr>
<td>Employee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>17</td>
<td>30.4</td>
</tr>
<tr>
<td>101-1000</td>
<td>12</td>
<td>21.4</td>
</tr>
<tr>
<td>1001-5000</td>
<td>8</td>
<td>14.3</td>
</tr>
<tr>
<td>&gt;5000</td>
<td>4</td>
<td>7.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>15</td>
<td>26.8</td>
</tr>
<tr>
<td>Sales (Million $)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>7</td>
<td>12.5</td>
</tr>
<tr>
<td>1-10</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>10-50</td>
<td>4</td>
<td>7.2</td>
</tr>
<tr>
<td>50-100</td>
<td>4</td>
<td>7.2</td>
</tr>
<tr>
<td>&gt;100</td>
<td>5</td>
<td>8.9</td>
</tr>
<tr>
<td>Unknown</td>
<td>22</td>
<td>39.2</td>
</tr>
</tbody>
</table>

Summary of enterprises in the sample is shown in Table I. We found no significant differences in industry and organizational size when comparing the averages of eight responses in the foreign trade sector with that of the 45 responses in the manufacturing sector. Services sector is not compared since there are only three responses in it.

V. DATA ANALYSIS

The research model was tested using a covariance-based SEM. In order to assess the model, we perform evaluations on the measurement model and the structural model. The evaluation on the measurement model includes an exploratory factor analysis (EFA) to identify the constructs, and to examine the convergent and discriminant validity of the research instrument. The evaluation on the structural model consists of estimation of path coefficients and their associated significance.

The empirical results provide strong overall validation of causal relationships between the constructs in the four stages, forming a dynamic chain among strategy, IT-related resources, and e-business capabilities in e-business implementation process. Out of 11, 9 hypotheses are supported in our study; we also provide an overall validation of the model of e-business implementation process shown in Fig. 2. The findings of this research are significant and meaningful to understanding the mechanism of organizational transformation under e-business strategy.

A. Finding Related to Strategic Initiative

Results show that successful strategic initiative is associated with manager’s attitude and commitment, IT infrastructure, and internal funds. It suggests that IT infrastructure should be...
TABLE II
RELIABILITY ANALYSIS

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Identifier</th>
<th>Number of items</th>
<th>Cronbach α</th>
<th>Number of data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information systems</td>
<td>IS</td>
<td>9</td>
<td>0.9459</td>
<td>56</td>
</tr>
<tr>
<td>Supply chain e-readiness</td>
<td>SCR</td>
<td>3</td>
<td>0.7937</td>
<td>54</td>
</tr>
<tr>
<td>Attitude and commitment</td>
<td>AC</td>
<td>6</td>
<td>0.8748</td>
<td>56</td>
</tr>
<tr>
<td>IT human resources</td>
<td>ITHR</td>
<td>5</td>
<td>0.9090</td>
<td>56</td>
</tr>
<tr>
<td>Collaborative processes capabilities</td>
<td>CPCs</td>
<td>5</td>
<td>0.8925</td>
<td>56</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>ITI</td>
<td>3</td>
<td>0.8208</td>
<td>56</td>
</tr>
<tr>
<td>Information sharing capabilities</td>
<td>ISCs</td>
<td>3</td>
<td>0.9136</td>
<td>56</td>
</tr>
<tr>
<td>Industry and network e-readiness</td>
<td>INR</td>
<td>2</td>
<td>0.7362</td>
<td>54</td>
</tr>
<tr>
<td>Internal funds</td>
<td>IF</td>
<td>1</td>
<td>—</td>
<td>55</td>
</tr>
</tbody>
</table>

Overall 37 0.9145

TABLE III
COVARIANCE MATRIX OF ALL VARIABLES (N = 56)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D</th>
<th>IS</th>
<th>SCR</th>
<th>ITHR</th>
<th>CPCs</th>
<th>ISCs</th>
<th>INR</th>
<th>AC</th>
<th>ITI</th>
<th>IF</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS</td>
<td>2.204</td>
<td>0.882</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SCR</td>
<td>3.133</td>
<td>0.732</td>
<td>-0.04</td>
<td>0.54</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ITHR</td>
<td>2.820</td>
<td>0.894</td>
<td>0.20</td>
<td>-0.03</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>CPCs</td>
<td>2.666</td>
<td>0.914</td>
<td>0.48</td>
<td>0.01</td>
<td>0.41</td>
<td>0.84</td>
<td></td>
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<tr>
<td>ISCs</td>
<td>2.479</td>
<td>0.837</td>
<td>0.31</td>
<td>0.08</td>
<td>0.23</td>
<td>0.40</td>
<td>0.70</td>
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<tr>
<td>INR</td>
<td>2.230</td>
<td>0.910</td>
<td>-0.04</td>
<td>0.32</td>
<td>0.19</td>
<td>0.13</td>
<td>0.14</td>
<td>0.88</td>
<td></td>
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<tr>
<td>AC</td>
<td>2.786</td>
<td>0.919</td>
<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
<td>0.16</td>
<td>0.09</td>
<td>0.24</td>
<td>0.84</td>
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<tr>
<td>ITI</td>
<td>3.700</td>
<td>0.960</td>
<td>0.22</td>
<td>-0.12</td>
<td>0.37</td>
<td>0.32</td>
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<td>0.13</td>
<td>0.13</td>
<td>0.94</td>
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<tr>
<td>IF</td>
<td>3.090</td>
<td>0.720</td>
<td>-0.04</td>
<td>-0.08</td>
<td>-0.16</td>
<td>-0.18</td>
<td>-0.05</td>
<td>-0.09</td>
<td>-0.11</td>
<td>-0.19</td>
<td>0.52</td>
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Fig. 2. Structural model results.

TABLE IV
FIT INDEXES OF STRUCTURAL MODEL

<table>
<thead>
<tr>
<th>Indices</th>
<th>$\chi^2$</th>
<th>df</th>
<th>CFI</th>
<th>GFI</th>
<th>RMSEA</th>
<th>NFI</th>
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<tr>
<td>Result</td>
<td>40.11</td>
<td>23</td>
<td>0.91</td>
<td>0.90</td>
<td>0.068</td>
<td>0.73</td>
</tr>
<tr>
<td>Thresholds</td>
<td>$\chi^2$ / df ≤ 3</td>
<td>≥ 0.9</td>
<td>≥ 0.9</td>
<td>≤ 0.08</td>
<td>≥ 0.6</td>
<td></td>
</tr>
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</table>
the most important factor among three factors and that it is a strong base for building and implementing strategic initiative (loading = 0.74). Also, the manager’s consciousness of e-business plays an important role in developing e-business at a firm’s strategy level (loading = 0.58). In the order of importance, they are building IT infrastructure, manager’s positive attitude and commitment, and then, internal funds. Managers are aware that the evaluation of IT infrastructure needs to be undertaken prior to e-business initiative, so as to prevent from possible failure. Then, along with initiating e-business, top manager’s attitude impacts on organizational strategic orientation and planning activities.

The negative relationship between strategic initiative and internal funds (loading = −0.56) suggests that, in China, e-business strategic initiative is still under control of the government. Since subjects in our study are state-owned enterprises and state-supported foreign trade enterprises, many of them adopted e-business because they were told to do so. Insufficient internal funds are not as important as to receive support and benefits from the government. Government has orchestrated many policies to support enterprises to develop e-business. These policies have provided many benefits, such as lower export tax, and have lured many enterprises to adopt e-business. Our survey showed they adopted e-business with insufficient internal funds.

Adoption of e-business in Digital China Management Systems, Ltd. (DCMS), Beijing, is a convicive example in supporting the aforementioned findings. DCMS is a successful integrated IT solution provider, and its e-business strategy focuses on seamless transactions and coordination between DCMS and dealers. In 2000, an e-business project called “E-Bridge” platform was developed to achieve the goal. DCMS has already had a back-end supporting ERP system. Integrating it with intranet network has enabled “E-Bridge” platform for easy communication between DCMS and dealers, accurate transmission of information, and online transaction. E-business implementation affected everyone in various departments of the company. A special group for e-business project is constituted to accelerate the development. Everyone realized that the project has higher priority over others and the effect of “E-Bridge” was tremendous. Ninety percent of sales orders have been completed through the E-Bridge and order time was reduced from 1.5 h in 1999 to 20 s in 2004 [51]. This case reveals that the construction of IT infrastructure should be one important base and antecedence of e-business planning, and top manager’s consciousness of e-business and his leading role can also determine e-business strategic orientation and outcome.

B. Finding Related to Integrative Use of IT Related Resources

Support of Hypotheses H2a and H2b demonstrates a critical causal relationship between the strategic initiative and IT-related organizational resources. It is observed that successful strategic initiative will lead to deploy and utilize IT-related organizational resources for generation of e-business capabilities. Along these lines, it is interesting to note that strategic initiative directly affects the development of IT human resource (γ = 0.47, p < 0.01) that has the abilities and skill to apply IT in information sharing and business process. Strategic initiative also directly affects the design and deployment of information systems (γ = 0.47, p < 0.01) that is the base for providing the ISCs, and indirectly impacts the CPCs.

This study reveals the significant effect of e-business strategy on integrating IT-related resources, which helps us understand the relationships between strategic initiative and organizational resources, such as information systems and IT human resource. Through effective and reasonable strategic initiative, organizations tend to provide training to advance IT skills and management participation abilities of employees, and to develop its in-house information systems before initiating e-business programs [26]. Melville et al. [30] and Ross et al. [39] only identify IT assets underlying a firm’s IT capability, but did not discuss how organizations deploy and utilize IT assets and IT capabilities. Our research advances previous research by finding the role of strategy in integrative utilizing information systems and IT human resource and a critical causal relationship between the strategic initiative and IT-related organizational resources in organizational transformation after adopting e-business.

C. Finding Related to Generation of Information Sharing Capabilities

The support of H3b, H3c, and H3d indicates that ISCs are high-order organizational capabilities, and its generation relies on the integration of IT-related organizational resources including information systems (β = 0.30, p < 0.01), IT human resources (β = 0.15, p < 0.05), and external partner e-readiness (β = 0.17, p < 0.05). Our analysis does not support hypothesis H3 a (β = 0.08) at 0.05 significance level, implying that strategic initiative does not have a direct impact on information sharing capabilities. The effect of strategic initiative is on deploying and utilizing IT-related resources for creating e-business capabilities.

More specifically, the information systems and the intelligent assets (internal IT human resources and external partner resources) have to be aligned with each other to create certain high-order ISCs for better communication and coordination across value chain members. Given the importance of alignment of information systems and intelligent assets, it indicates that information sharing capability requires managerial and technological experience and skill to utilize information technologies. Therefore, the establishment and possession of information sharing capability is more important than the possession of Internet and IS to e-business implementation across the value chain.

This finding offers a theoretical extension to the IT business value research stream. In IT business value literature, performance effects are not in earlier studies because they dealt with IT components such as personal computer and IT capital, but did not take into account the issues of resource synergies [10]. We argue that integrating information systems and intelligent assets (internal IT human resources and external partner resource) under strategic guidance can create information sharing capabilities. We emphasize here the significance of integrating IT resources to create business value.
Case study of Li and Chang [26] on Haier Group, one of the world’s top 500 companies, provides a successful example in information sharing with its business partners. Realizing that e-business was largely about the fast speed of information flow, capital flow, and logistic flow, Haier initiated e-business strategy in its program and projects. One of them is B2B procurement platform (http://www.ihaiер.com). “With this platform, Haier was able to seek its best suppliers in global competitive market, set up close partner relationship with its suppliers and reduce the purchase cost while improving product quality. This platform had the functions of online bidding, online procurement, and online order tracking and payment processing and production control process” [26]. The e-business practices helped Haier to achieve information sharing with its suppliers, improve the speed of logistic flow, and find better and quality raw material with lower costs. “The effect of e-business on Haier was that its cycle time from sales order to procurement order was reduced from more than seven days in 2000 to less than one hour in 2002. Also, the procurement cycle was reduced from 10 days in 2000 to three days in 2002” [26]. This case strongly supports that ISCs are the result of deploying strategic initiative and utilizing IT-related resources.

D. Finding Related to Generation of Collaborative Process Capabilities

Strong support of H4a and H4b implies that the generation of CPCs depend upon the concurrent effect of both IT human resources ($\beta = 0.22, p < 0.01$) and ISCs ($\beta = 0.46, p < 0.01$). It suggests that when the firm has people who are both technically and organizationally capable of engaging in electronic interactions with partners (i.e., suppliers, dealers, and customers), higher levels of CPCs such as online transaction with dealers and suppliers, and the provision of online customer service can be expected. Frohlich [15] suggests that IT innovation enhances information sharing and coordination with their partners improve certain firm-specific processes. We further explain how IT-related resources and ISCs support organization’s collaborative process over Internet. Together, it helps us understand the underlying relationship between CPCs and ISCs in supply chain management.

1) Role of IT Human Resources: Hypotheses H3c, H4a, and H4b address a potential feedback loop between IT human resources and CPCs. It shows how firms increase IT human resource levels to improve ISCs so that a higher level of CPCs can be achieved. It illustrates the important role played by IT human resources in a firm’s e-business implementation. The alliance of human, technology, and information reinforce the creation of CPCs. We suggest that employees’ IT practice experience helps building confidence and competence for controlling and transferring business information in collaborative process.

2) Role of Information Sharing Capabilities: Hypotheses H2–H4 except H3a confirm that ISCs are important intermediate capabilities transferring IT-related organizational resource into CPCs. A firm will experience two stages when it begins an e-business strategic planning. The first stage is that integrating and deploying IT-related resource create information sharing with internal and external partners, and the other stage is that information sharing results in improving collaborative process and enhancing the organizational performance. High levels of ISCs will lead to high level of CPCs. This intermediate transferring capabilities illustrates the core role of ISCs in e-business implementation process.

In a recent article, Carr [7] questions the strategic significance of IT resources. He argues that since IT is widely available to most of the firms today, it cannot be a competitive advantage. However, Ray et al. [38] argue that firms who fail to efficiently and effectively translate their resources and capabilities into business processes cannot expect to realize the competitive advantage potential of these resources. We explain that ISCs are more important factor than are IT-related resources, and serve in converting IT-related resources into CPCs for better organizational performance.

VII. Conclusion

Since e-business is causing organizational transformation and improving performance, there is a need to know more about the implementation process and the causal relationships within to be successful. Drawing upon RBV and e-business strategy literatures, this paper proposes a model to conceptualize e-business implementation process through four stages according to three dimensions and six constructs. Eleven hypotheses are designed to test the relationships providing theoretical support of a causal link from e-business strategy planning to integrative use of IT-related resources, and consequently, generating distinctive e-business capabilities. The model is evaluated with data collected from 56 enterprises in China. Theoretical and practical contributions are also drawn from the findings of the study.

From a theoretical perspective, this paper has made a contribution by presenting a dynamic and theory-based vision of the organizational transformation through demonstrating causal relationships in e-business implementation process. We have observed that previous studies were based on a single dimension and somewhat fragmented. For example, works in e-business value creation process focus on resources and capability without consideration of the role of strategy [30], [39], [56]. Researchers often overlook how strategic initiative deploys and utilizes IT assets and IT capabilities. They emphasize the integration of resources to achieve e-commerce value, and omit the relationship between resources and strategy. We adopt a multidimensional approach. The proposed model is established from multiple disciplines to expand our understanding of the dynamics and completeness of transformation in the implementation process. Our research has demonstrated the causal relationships among strategy, IT-related recourses, and e-business capabilities and their roles in determining organizational transformation and outcome of implementation. In this sense, this research is a first step toward understanding the complex relationships within the implementation process. It also provides the underlying mechanisms of organizational transformation enabled by the Internet.

In addition, this paper demonstrates that ISCs are intermediate forces to convert IT-related organizational resource into CPCs in e-business implementation process. A high level of ISCs will lead to a high level of CPCs. It is suggested that the establishment and possession of information sharing capability is more...
important than the possession of IT-related resources such as Internet and IS. Most scholars acknowledge that resources, by themselves, cannot be a source of competitive advantage. That is, resources can only be a source of competitive advantage if they are used to “do something” [38]. Further, firms that fail to efficiently and effectively translate their resources into business processes cannot expect to realize the competitive advantage potential of these resources [38]. Our research explains how capability can make resources become a source of competitive advantage. Instead of using traditional financial performance, a common final measure of outcome for e-business implementation, future research can use ISCs as an indicator of ongoing performance measure. Through the measurement of information sharing capabilities, one may be able to avoid and prevent a discrepancy between the expected strategic objective and the actual performance.

However, we observe several practical implications. First, there is evidence that IT infrastructure in China has more significant influence upon e-business strategy initiative than managers’ attitude and commitment. This is due to the fact that China still does not have a robust IT infrastructure yet. Unlike the popular e-business adoption view in developed countries [11], [17], managers’ e-business awareness is observed as the most important position among all factors related to e-business adoption. This evidence is supported by the findings of Molla and Licker that the low level of ICT diffusion in an economy can also limit the level of e-business awareness [31]. So, in e-business, strategy planning stage of developing countries significantly differs from that of developed countries, and is more challenging due to the nature of different IT infrastructure. This finding has important implications for policy makers and managers in developing countries. Firms are also advised to assess their IT infrastructure status before deciding an investment.

Second, our research confirms the significant effect of e-business strategy initiative on integrating IT-related resources to create information sharing capabilities. We also find the effects of strategic initiative on both IT human resources and information systems. Therefore, strategic initiative should focus on the utilization of resources and target valuable resources to create e-business capabilities. This is valuable for managers to understand the potential benefits of IT human resources and IS, and convey to the strategic initiative accordingly. This finding is also supported by Gregorio et al. [18]. They report that a country’s e-business activity depends not only on ICT infrastructure, but also on human capital and logistics infrastructure. Barua et al. [3] suggest that “many firms invest in enterprise resource planning (ERP) systems to achieve, among other things, systems integration across the organization, which our results suggest is an antecedent of online information capabilities on both customer and supplier sides”. High-performing e-commerce organizations use their information systems strategic orientation to support their operations strategies of flexibility and delivery [6].

Third, the findings show that ISCs and IT human resources exhibit positive relationships to CPCs, and in parallel, IT human resources also directly affect ISCs. Therefore, they produce an embedded resource–capabilities bundle, suggesting that they have contributed to business value. Researchers [4], [23], [57] propose that the ability to mobilize IT resources in conjunction with other resources is critical to superior performance. Our research highlights the significant effects of resource–capabilities bundle. It indicates that the integration of e-business capability and IT human resources reinforces the main effects.

Finally, we want to point out a few limitations of the study. In order to generalize the findings, more samples need to be collected. Our data rely on a single Asian country. Thus, sample data from one or more Western countries are needed to further generalize the findings. This cross-national comparison may reveal the potential impact of national differences (e.g., national culture, country-specific e-business practices, and societal uniqueness in IT human resource and capabilities relationships). Moreover, the model is not robust enough to cover all possible factors to e-business strategy initiative; future work should consider the factors depending on the industry, which might influence the strategy for integrating and utilizing the IT-related resource. Despite this and other potential limitations, we believe that our study offers important implications for e-business research and practice by shedding light on the effects of strategy, IT-related resource, and e-business capabilities on Internet-enabled organizational transformation.

### Appendix

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<th>Survey variables</th>
<th>Label</th>
<th>Question item</th>
<th>Scales</th>
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<td>Strategic Initiative</td>
<td>AC1</td>
<td>1. A plan for ICTs and e-business</td>
<td>None 1 2 3 4 5</td>
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<tr>
<td>Attitude and commitment</td>
<td>AC2</td>
<td>2. An implementation plan for adoption of ICT</td>
<td>1 2 3 4 5</td>
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<tr>
<td></td>
<td>AC3</td>
<td>3. A general understanding of the benefits of ICTs</td>
<td>1 2 3 4 5</td>
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<tr>
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<td>AC4</td>
<td>4. A strategic orientation</td>
<td>1 2 3 4 5</td>
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<td></td>
<td>AC5</td>
<td>5. Identification of specific benefits of ICTs for company</td>
<td>1 2 3 4 5</td>
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<tr>
<td></td>
<td>AC6</td>
<td>6. International aspirations</td>
<td>1 2 3 4 5</td>
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<td>IT Infrastructure</td>
<td>IT11</td>
<td>7. Access to internet</td>
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</tr>
<tr>
<td></td>
<td>IT12</td>
<td>8. Other equipment (printers, scanners, etc)</td>
<td>1 2 3 4 5</td>
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<td></td>
<td>IT13</td>
<td>9. Computer(s)</td>
<td>1 2 3 4 5</td>
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<td>Internal funds</td>
<td>IF1</td>
<td>10. Internal funds for current and projected needs</td>
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