

Exploring the Performance Impact of Web-based Direct Procurement Systems: From the Perspective of Process Integration

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Abstract: - In addressing the issue of value derived from Web-enabled direct procurement, this study attempts to investigate the impact of Web-based direct procurement systems on intra- and inter-organizational process integration capabilities and organizational performance. A sample of 131 manufacturing firms with experience participating in government-subsidized e-business development projects is surveyed, with resulting data subject to partial least squares analysis to investigate the performance impacts of Web-based direct procurement systems. The results reveal that implementing Web-based direct procurement systems enables firms to improve their intra- and inter-organizational process integration capabilities which, in turn, yield sustained gains in organizational performance.

Key-Words: - Web-based direct procurement system, Information technology value, Intra-organizational process integration capability, Inter-organizational process integration capability, Organizational performance

1 Introduction

Direct procurement addresses the raw materials, components and sub-assemblies (i.e., production inputs) that are used in the manufacturing process of a finished product. Previous studies suggested that direct procurement can be regarded as means of strengthening a firm's competitive capabilities by combining suppliers' resources [26][38]. For realizing the combinative effects of complementary resources and capabilities requires firms to implement strategies for integrating intra- and inter-business resources. Numerous strategies have been proposed by previous studies to improve the effectiveness of intra- and inter-business resource integration, such as developing collaborative activities with strategic partners and establishing coordination mechanism to adjust mutual activities [14][21]. Although resource integration strategies varied in focus, all these depend on one key element – information, because the implementation of these strategies concerns intra- and inter-organizational process integration and needs for frequent communication between firms' different departments and with suppliers. Therefore, streamlining information exchange between firms' different departments and with suppliers is the primary task in the direct procurement context.

With the increasing availability of lower-cost public network infrastructures and the development

of network standards (e.g., Web Service), a number of Web-based solutions have emerged, providing useful means for firms to conduct intra- and inter-organizational process integration [25][43]. Web-based direct procurement system is one of these Web-based solutions. With the advantage of platform independence and infrastructure flexibility, Web-based direct procurement system allows organizations to easily form integrated linkages between their different departments and with their trading partners who may be operating different internal systems [5][23]. Unlike electronic data interchange (EDI), either VAN-based or Internet-based EDI, Web-based direct procurement system is transformational and enabling infrastructure, and using it for conducting direct procurement activities will have significant impact on organizational performance.

While the benefits of Web-based business applications are addressed in previous studies, little research has been conducted to investigate performance impacts of Web-based systems for direct procurement. A line of research associating with Web-based technologies has been focusing on the impacts of indirect procurement (e.g., [9][13][34][36]). The knowledge used and gained in analyzing performance impacts of e-procurement in indirect procurement may not apply in the case of

direct procurement, as the concerning issues are likely to be different for different procurement categories. In light of business value supported by the implementation of Web-based indirect procurement, the existing body of knowledge has resulted from an organization-centric perspective based on internal business processes, organizational structure, and workplace practices (e.g., [9][13][34][36]). This indicates that it has less concern for supply chain governance and inter-organizational processes integration, which are important issues in managing direct procurement.

Direct procurement over the Web-based platform provides electronic linkages within and among organizations. These links can alter the ways in which firms integrate intra-organizational process and inter-organizational process [7][38], and raises new questions about how Web-based direct procurement systems can be applied to improve organizational performance. For addressing the emerging issues in the context of direct procurement, this study attempts to understand performance impacts of Web-enabled direct procurement comprehensively from both organizational and inter-organizational level. Specifically, this study addresses the following research questions:

What are the impacts of Web-based direct procurement system on the improvement of intra-organizational process integration and inter-organizational process integration? Whether can organizational performance be improved by increasing intra-organizational process integration and inter-organizational process integration?

2 Literature Review

2.1 Difference between direct and indirect procurement

Direct and indirect procurement deal with different procurement categories and therefore are subject to different considerations. Indirect goods are not part of the finished product and tend not to be industry-specific [9][38]. Because most indirect goods are available from a variety of vendors and are priced more sensitively to market forces, firms tend to seek the widest possible breadth of suppliers to find the lowest possible cost. In contrast, direct procurement addresses components that are used in the manufacturing process of a finished product and the components tend to be firm-specific [8][14]. Direct

goods are mostly critical components which directly contribute product performance or differentiation. Therefore, firms tend to seek out qualified, established and reliable suppliers to meet their requirements for specialized logistics and fulfillment mechanisms.

Previous research on the impact of Web-enabled indirect procurement focuses on market mechanisms, such as price reduction and transactional efficiencies, and is less concerned with issues of supply chain governance and inter-organizational processes integration [13][34][36]. Specifically, the existing body of knowledge regarding the business value of Web-enabled indirect procurement comes from an organization-centric perspective. An organization-centric perspective focuses on the interests of the firm only, without considering the external supply chain environment. Managing direct procurement requires complex inter-organizational coordination and collaboration, since direct procurement involves managing suppliers to integrate the purchasing firm within the supply chain [7][15][38]. Hence, previous research on Web-enabled indirect procurement is insufficient to explain the benefits of Web-enabled direct procurement, and an alternative conceptualization of Web-enabled business value is required.

2.2 Direct procurement management

Manufacturers can increase their business performance by combining the resources and capabilities of their direct material suppliers through embedding inter-organizational cooperation in their direct procurement operations [4][8]. To obtain the benefits of direct procurement, firms not only have to streamline their procurement processes, but also have to strengthen the governance of their complicated interactions with their direct material suppliers [7][15]. For example, a purchasing firm must coordinate the activities of direct material suppliers to ensure interoperability and seamless process synchronization. Direct procurement requires intensive communication and interaction between trading firms to ensure the alignment of activities between trading firms [14][38]. Hence, this study suggests that success in managing direct procurement needs to enhance capabilities of integrating intra-organizational process and inter-organizational process.

A firm's capability in intra-organizational process integration means that the firm has the ability to increase efficiencies while conducting direct procurement cycle activities [26][38]. The

intra-organizational process integration capability takes into account how a firm can effectively address issues of streamlining the processes of managing direct procurement requirements. For example, if a firm can effectively reduce the error rate of direct material orders, shorten the time required to purchase direct materials, and/or improve overall planning for direct procurement, inventory, and production management, we can argue that the firm is likely to have intra-organizational process integration capability. In contrast with the intra-organizational process integration, a firm's inter-organizational process integration capability in managing direct procurement implies that the firm has the ability to integrate the activities of direct materials suppliers to meet the firm's needs [7][14][38]. Inter-organizational process integration capability demonstrates how a firm can effectively address issues of governing interactions with its direct materials suppliers. For example, if a firm can effectively encourage direct material suppliers to share information, collaborate on problem solving, and/or adjust order fulfillment work to meet the firm's needs, we can argue that the firm is likely to have inter-organizational process integration capability.

2.3 Web-enabled direct procurement

In the pre-Internet era, the most common method for information exchange in direct procurement was by EDI. However, the widespread use of EDI was limited by high implementation costs, high technology lock-in costs and the inability to process unstructured information [28][36]. With the development of lower-cost public network infrastructures and standards (e.g., Web services), a number of Web-based business-to-business (B2B) systems have emerged to allow firms to conduct B2B transactions [25][41]. Web-based B2B system refers to a kind of information system built on Web platforms using open standards (including communication protocols and data standards) for B2B information exchange [9][12]. The Web-based platform provides a vast hypermedia computer network environment which substantially reduces the information exchange constraints found in traditional EDI (either VAN-based or Internet-based EDI). Web-based B2B system capitalizes on rich-media interfaces and hypermedia architecture, enabling firms to simplify and enhance the two fundamental aspects of procurement management: communication and transaction [38][43].

The defining feature of Web-based B2B system is the use of Extensible Markup Language (XML) to form the content platform [25][43]. A Web-based B2B system using XML-based protocols contains platform-agnostic interpretable metadata about the interface [39]. This platform-agnostic interface allows enterprises to build a cost-effective system integration infrastructure and create a universal computing environment in which the enterprise systems of all trading firms can share data [5][19]. The platform- and programming language-agnostic nature of a Web-based direct procurement system allows firms and their trading partners to more easily exchange data on inventory, production status and delivery schedules, thus improving inter-organizational coordination in a way not possible with traditional EDI [38].

Web-based direct procurement systems offers advantages over traditional EDI, including savings in communication, search and negotiation costs, speed and ease of integration of different enterprise systems, and the provision of real-time information about procurement transactions [34][36][40]. While EDI reduces procurement processing costs and errors, Web-based direct procurement systems have the additional potential to further reduce costs while improving the quality and advancing the content of inter-organizational coordination. Unlike proprietary EDI systems, the open architecture of Web-based direct procurement systems can access and control not only transactions, but also the internal supply and planning processes of trading parties without requiring those parties to adopt common systems [7][38]. The use of Web-based direct procurement systems enables the electronic processing of direct procurement transactions, improving firms' capabilities in deal sourcing, order processing, monitoring and coordinating activities of suppliers.

3 Research Model

Fig. 1 details our research model. It posits relationships among Web-based direct procurement system, intra-organizational and inter-organizational processes integration capabilities, complementary effect between intra-organizational process integration capability and inter-organizational process integration capability, and organizational performance.

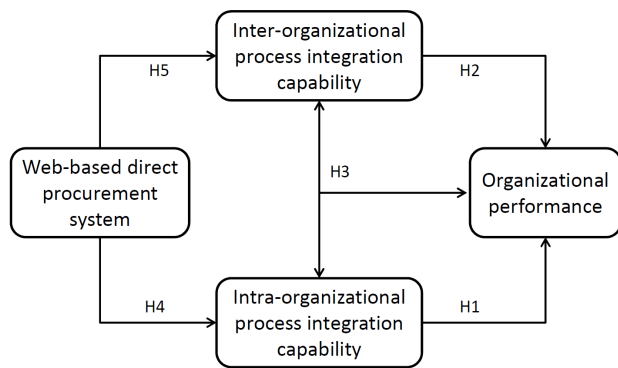


Fig. 1: Research model

3.1 The impact of process integration on organizational performance

Improving intra-organizational process integration is one of the major ways of improving organizational performance [7][8]. To achieve this improvement, firms have to refine their internal procurement processes [26][33]. In refining internal procurement processes, firms focus on developing capacity to improve the alignment between procurement and business requirements. For example, firms develop capacity to reduce mistakes in direct procurement, systematically integrate the procurement requirements of direct materials, and improve overall planning for direct procurement, inventory and production management [7][15]. Thus, Hypothesis 1 (H1) is proposed:

H1. A firm's superior intra-organizational process integration capability in direct procurement context positively influences the firm's organizational performance.

Improving inter-organizational process integration is another major way of improving organizational performance [12][40]. To improve inter-organizational process integration capability, firms not only build inter-organizational information sharing mechanisms, but also build inter-organizational coordination mechanisms with their direct material suppliers [17][38]. In building information sharing mechanisms, firms focus on developing capacity to improve the efficiency of information sharing with their direct material suppliers. For example, firms and their direct material suppliers can keep each other informed in advance of changing needs and work together to solve problems [15][37]. In building coordination mechanisms, firms focus on developing capacity to increase the alignment of their direct materials

suppliers' order fulfillment processes to their business requirements. For example, firms can synchronize with the output of direct material suppliers' order fulfillment work, thus ensuring that the right supplies are delivered at the right time [7][38]. Thus, Hypothesis 2 (H2) is proposed:

H2. A firm's superior inter-organizational process integration capability in direct procurement context positively influences the firm's organizational performance.

Besides single effects provided by intra-organizational process integration capability or inter-organizational process integration capability, it is interesting to investigate whether there exists complementary effects between the two process integration capabilities. From a resource-based view (RBV), previous studies on business value creation suggested that combining different business capabilities can sometimes be much more valuable than these business capabilities themselves when these capabilities are complementary [26][30][31]. Hence, we further investigate the complementary effect between intra-organizational process integration capability and inter-organizational process integration capability. The ability to govern direct material suppliers (i.e., inter-organizational process integration capability) will have an impact on a firm's capability to align procurement activities and business requirements [7][15]. Better to place, confirm and track orders with direct material suppliers allows a firm to improve material flows and reduce inventory costs. Moreover, the ability to jointly plan direct procurement and other business processes (i.e., intra-organizational process integration capability) will have an impact on a firm's capability to collaborate with direct materials suppliers [33][38]. Thus, Hypothesis 3 (H3) is proposed:

H3. The complementary effect between intra-organizational process integration capability and inter-organizational process integration capability in direct procurement context positively influences a firm's organizational performance.

3.2 The impact of Web-based direct procurement system on process integration capability

Through Web-based direct procurement systems, firms can conduct direct procurement activities electronically. The electronic processing of inter-

organizational trading data improves the timeliness and accuracy of the information, leading to greater efficiency in procurement processes [1][8]. Previous studies have suggested that companies derive many benefits from implementing Web-based direct procurement systems, including reduced transaction costs, improved internal procurement process efficiency, and improved coordination with suppliers [2][29]. Conducting direct procurement management via Web-based direct procurement systems enables firms to refine internal direct procurement processes, streamline direct procurement transactions, and strengthen the mechanisms for information sharing and coordination with their direct material suppliers [38]. Thus, this study suggests that IT capabilities derived from implementing Web-based direct procurement systems can be employed to increase firms' capabilities in integrating intra-organizational process and inter-organizational process.

Web-enabled direct procurement can help firms improve the timeliness and accuracy of their transaction information, allowing them to better plan and manage their production operations and inventory levels [7][16]. These intra-organizational level improvements will result in lower costs, higher productivity and streamlined processes. Web-based direct procurement systems enable firms to electronically manage their direct procurement processes and to re-engineer their internal processes, resulting in benefits such as reduced transaction errors, sourcing costs and administrative tasks associated with monitoring and controlling direct procurement processes [7][33]. This study thus suggests that IT capabilities derived from implementing Web-based direct procurement systems can be employed to increase firms' capabilities in integrating intra-organizational process. Thus, Hypothesis 4 (H4) is proposed:

H4. IT capabilities derived from implementing Web-based direct procurement systems positively influences a firm's intra-organizational process integration capability.

Increased outsourcing of manufacturing operations makes it more important for firms to effectively integrate their direct material suppliers' processes [7][14]. To achieve effective inter-organizational process integration, companies have to move their exchange of information beyond just annual contracts and periodic progress reporting to the large-scale exchange of internal planning information [17][37]. In direct procurement through

EDI, the information that trading parties can exchange is limited by the text-based communication interface [9][42]. Web-based direct procurement systems capitalize on rich-media interfaces and hypermedia architectures, enabling the sharing of more complex information. The information exchange platform provided by Web-based direct procurement systems allows firms and their trading partners to communicate intensively, thus increasing the efficiency of inter-organizational process integration [38][40].

This study suggests that Web-based direct procurement systems can enable firms to exchange information with their direct material suppliers at many levels within their respective organizational hierarchies, from strategy to operations. Implementing Web-based direct procurement systems to conduct inter-organizational activities allows for the sharing of strategic and operational information, and allows for all shared functions to be brought together as a cohesive whole, providing the visibility required for quick and accurate decision-making and timely adjustments [15][38]. Implementing Web-based direct procurement systems can enable firms to build a better information-sharing environment and facilitate any required changes and adjustments. According to the above arguments, this study suggests that IT capabilities derived from implementing Web-based direct procurement systems can be used to increase firms' capabilities in integrating inter-organizational process. Thus, Hypothesis 5 (H5) is proposed:

H5. IT capabilities derived from implementing Web-based direct procurement systems positively influences a firm's inter-organizational process integration capability.

4 Research Methodology

4.1 Construct measurement

The four constructs of interest in this study are: IT capabilities derived from Web-based direct procurement systems, intra-organizational process integration capability, inter-organizational process integration capability, and organizational performance. To construct a pool of items to measuring these four constructs, several tests were administered in stages. This study began by reviewing and collecting items from a variety of previous studies. On the basis of previous studies (e.g., [5][12][19][25][38][43]), the

construct of IT capabilities derived from Web-based direct procurement systems is conceptualized as the extent to which a firm can effectively utilize Web-based direct procurement system to manage direct procurement, and items reflecting the conceptualization of IT capabilities derived from Web-based direct procurement systems are proposed. On the basis of previous studies (e.g., [7][9][16][26][36][38]), the construct of intra-organizational process integration capability is conceptualized as the extent to which a firm has the ability to effectively streamline the processes of managing direct procurement requirements, and items reflecting the conceptualization of intra-organizational process integration capability are proposed.

On the basis of previous studies (e.g., [9][12][14][17][35][40][42]), the construct of inter-organizational process integration capability is conceptualized as the extent to which a firm has the ability to effectively build mechanisms to enable information sharing and coordination with direct material suppliers, and items reflecting the conceptualization of inter-organizational processes integration capability are proposed. On the basis of previous studies (e.g., [11][26][27][30][31]), the construct of organizational performance is conceptualized as the extent to which a firm can advance its organizational performance through effectively conducting direct procurement, and items reflecting the conceptualization of organizational performance are proposed.

A content validity panel was convened to consider the items collected from the literature review to determine the applicability and semantics of each item. The panel members in this study consisted of six managers from manufacturing firms and two researchers focused on information management, supply chain management and procurement management. The adoption criterion depended on the content validity ratio (CVR; $CVR = [n - N/2] / [N/2]$, n: the sum of frequency for scoring 2 or 3, N: total number of members in the panel). This study followed the suggestion by Lawshe [20] that the CVR of each item must equal or exceed 0.75 (Lawshe [20] proposed that if the number of members in the panel was eight, the CVR must be greater than 0.75). Useful comments from the validity panel members were incorporated to assess the four constructs (i.e., IT capabilities derived from Web-based direct procurement systems, intra-organizational process integration capability, inter-organizational process integration capability, and organizational performance). These items were then modified to create instruments for

the full-scale study (Table 1). Items associated with these constructs used a seven-point Likert-type scale.

Table 1: Item content

Constructs/Measured variables
<p>(WP) Web-based direct procurement system</p> <p>WP1: Our direct material suppliers receive all our orders electronically through the Web-based direct procurement system.</p> <p>WP2: We can inquire the progress of direct procurement through the Web-based direct procurement system.</p> <p>WP3: We can confirm the order with our direct material suppliers through the Web-based direct procurement system.</p> <p>WP4: We can negotiate with our direct material suppliers through the Web-based direct procurement system.</p>
<p>(Intra) Intra-organizational processes integration capability</p> <p>Intra1: We can systematically integrate the procurement requirements of direct materials.</p> <p>Intra2: We can effectively make integrated plans for direct procurement and inventory management.</p> <p>Intra3: We can effectively make integrated plans for direct procurement and production management.</p> <p>Intra4: We can effectively make overall planning for direct procurement, inventory and production management.</p>
<p>(Inter) Inter-organizational processes integration capability</p> <p>Inter1: We and our direct material suppliers inform each other in advance of changing needs.</p> <p>Inter2: We and our direct material suppliers can collaborate on problem solving.</p> <p>Inter3: The work tasks between our company and our direct material suppliers can fit together well.</p> <p>Inter4: The output of our direct material suppliers' order fulfillment works is synchronized with our needs.</p>
<p>(OP) Organizational performance</p> <p>OP1: Our production lead time is short.</p> <p>OP2: We can effectively deal with demand uncertainties.</p> <p>OP3: We can effectively respond to market demands.</p> <p>OP4: Our inventory cost of direct materials is low.</p>

4.2 Subjects and data collection

A survey was conducted to test the research model. The empirical data was collected from 131 manufacturers with experience participating in government-subsidized e-business development projects. Focusing on direct procurement, these e-business development projects aimed to promote the domestic development of industrial information technologies and applications. Hence, the sample companies are qualified by having implemented Web-based direct procurement systems for conducting direct procurement management.

Purchasing managers were selected as respondents of this study. The key factor in respondent selection was the respondent's position within his or her organization, with preference given to respondents knowledgeable about direct procurement management and interaction with suppliers. The questionnaire was mailed to 250 purchasing managers. In responding to questions about the various constructs, respondents were asked to identify their organization's primary direct material supplier(s). Primary direct material supplier(s) were defined as those that supply a significant proportion of the respondents' direct material needs. In total, 131 valid questionnaires were returned, giving a 52.4% valid response rate.

Partial least squares (PLS) were used to evaluate the proposed research model (shown in Fig. 1) and the relevant hypotheses. PLS is generally recommended for predictive research models where the emphasis is on theory development [18]. Given the relative lack of empirical studies and theoretical development on Web-enabled direct procurement management, the PLS method of structural equation modeling is suitable for testing the research model. The PLS method can be used to simultaneously estimate both the measurement model and the structural model [6]. We divided the analysis of the research model proceeds into two steps: assessment of the measurement model's properties, followed by assessment of the structural model (testing of the hypotheses). Data analysis by PLS was performed with SmartPLS 2.0 (M3) software [32].

5 Data Analysis and Results

5.1 Assessment of the measurement model's properties

The measurement model was assessed via the PLS method to assess individual item reliability, internal

consistency reliability, and convergent and discriminant validity. Individual item reliability was assessed by examining the loading of each item to their respective constructs. Table 2 shows that all item loadings are above 0.707, indicating that more than half of the variance is captured by the constructs. The internal consistency reliability of each construct was assessed using Cronbach's alpha and computing the composite reliability (CR). A score of 0.70 or above is an acceptable value of internal consistency for exploratory research [3]. Table 2 shows the Cronbach's alpha (ranging from 0.892 to 0.916) and CR values (ranging from 0.919 to 0.938) of each construct. All were above the recommended level of 0.70, indicating adequate internal consistency.

Table 2: Factor loadings and reliability estimates

Construct/ measured variables	Factor loadings	Cronbach's alpha	CR
WP		0.911	0.932
WP1	0.875		
WP2	0.886		
WP3	0.869		
WP4	0.906		
Intra		0.914	0.935
Intra1	0.859		
Intra2	0.871		
Intra3	0.885		
Intra4	0.901		
Inter		0.916	0.938
Inter1	0.851		
Inter2	0.866		
Inter3	0.891		
Inter4	0.915		
OP		0.892	0.919
OP1	0.829		
OP2	0.857		
OP3	0.851		
OP4	0.910		

Table 3 shows the average variance extracted (AVE) and the square root of the AVE, as well as the correlations between the constructs. The percentage of variance captured by a construct is given by its AVE. Convergent validity is demonstrated as the AVE values for all constructs were higher than the suggested threshold value of 0.50 (ranging from 0.778 to 0.809). A construct is considered to be distinct from other constructs if the square root of its AVE is greater than its correlations with other latent constructs [3]. Comparing the square root of the AVE (bold figures

on the diagonal) with the correlations among the constructs indicates that each construct is more closely related to its own measures than to those of other constructs, and discriminant validity is, therefore, supported.

Table 3: Convergent and discriminant validity

Construct	AVE	1	2	3	4
1. WP	0.804	0.896			
2. Intra	0.806	0.381	0.897		
3. Inter	0.809	0.437	0.319	0.899	
4. OP	0.778	0.295	0.412	0.397	0.882

AVE: $Li^2 / (Li^2 + Var(Ei))$, Li = factor loading, $Var(Ei)$ = error variance

Diagonal elements (bold) are the square roots of AVE by latent constructs from their indicators

5.2 Assessment of the structural model

The PLS structural model and hypotheses were assessed by examining the path coefficients and their significance levels. The PLS method does not directly provide significance tests and confidence interval estimates of path coefficients in the research model [22]. To estimate the significance of path coefficients, we followed Chin et al. [6], in performing a bootstrapping analysis with 200 re-samples of the same size ($n = 131$). Hypotheses are either confirmed or not confirmed, based on whether the t-value associated with each path exceeded the criterion of practical significance for the 0.05 significance level (t-value > 1.96). Fig. 2 presents a graphic depiction of the PLS results, showing the standardized path coefficients among the constructs using the bootstrap re-sampling method and the R2 values for intra-organizational process integration capability, inter-organizational process integration capability, and organizational performance.

The results shown in Fig. 2 provide strong evidence for hypotheses 1 to 5. In our sample, organizational performance is significantly influenced by intra-organizational process integration capability, inter-organizational process integration capability and complementary effect between intra-organizational process integration and inter-organizational process integration capabilities (H1 is significantly supported, $r = 0.367$, t-value = 2.419; H2 is significantly supported, $r = 0.311$, t-value = 2.285; H3 is significantly supported, $r = 0.283$, t-value = 2.003) and the explanatory power is 0.571. This implies that intra-organizational process integration capability, inter-organizational process integration capability and complementary effect between the two process

integration capabilities could significantly explain organizational performance. This finding indicates that the robust capability in integrating intra-organizational process and inter-organizational process is the critical factor in determining a firm's organizational performance.

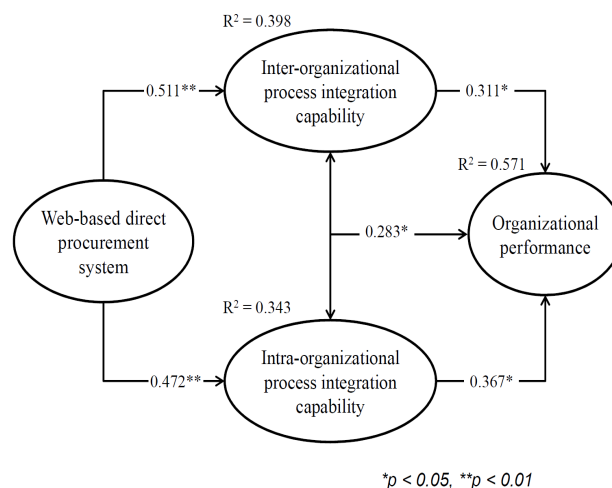


Fig. 2: PLS results

Furthermore, we found that intra-organizational process integration capability is significantly influenced by Web-based direct procurement system (H4 is significantly supported, $r = 0.472$, $t = 3.547$) and the explanatory power is 0.343. We also found that inter-organizational process integration capability is significantly influenced by Web-based direct procurement system (H5 is significantly supported, $r = 0.511$, $t = 3.818$) and the explanatory power is 0.398. The results reveal that firms with the implementation of Web-based direct procurement system can effectively improve their capabilities in integrating intra-organizational process and inter-organizational process.

6 Conclusion

This study investigates the impact of Web-based direct procurement system on intra-organizational process integration capability and inter-organizational process integration, and how the improvement of intra- and inter-organizational process integration capability contributes to enhancing organizational performance. The results from our empirical study provide substantial support for the research model depicted in Fig. 1. This empirical study of 131 manufacturing firms found that firms can enhance their organizational performance when they employ Web-based direct

procurement system to improve their capability in conducting intra-organizational process integration and inter-organizational process integration.

6.1 Implications

This study provides several important implications for both research and practice. In terms of research, the first implication of this study is to expand the conceptualization of the business value of Web-based e-procurement. Previous studies have tended to adopt an organization-centric perspective in investigating the business value of Web-based e-procurement, with results centered on the interests of the purchasing firm only, without consideration of the external supply chain environment. By investigating direct rather than indirect procurement, this study not only addresses the issues of intra-organizational process integration but also adds the issues of inter-organizational process integration to an expanded understanding of the business value of Web-based e-procurement. Another implication of the study is related to the role of Web-based direct procurement systems. A conceptual model for assessing the performance impacts of Web-enabled direct procurement was developed and tested on 131 manufacturing firms from different sectors. The results obtained in the present study suggest that Web-based direct procurement systems play a critical role in creating intra-organizational process integration capability and inter-organizational process integration capability which are key drivers of a firm's organizational performance.

Moreover, the results of this study have practical implications regarding the business value firms can derive from implementing Web-based direct procurement system. This study's findings confirm that executives and management should be aware that business capabilities (i.e., intra-organizational process integration capability and inter-organizational process integration capability) can be created via implementing Web-based direct procurement systems. They should recognize that their competitors also are able to implement the similar Web-based direct procurement systems and their failure to respond will result in a competitive disadvantage for their firm. Firms create the value of Web-enabled direct procurement by assembling IT resources and other valued resources that work together to create IT-driven business capabilities. Consequently, firms should plan their internal and external business processes, and create opportunities for inter-organization cooperation, based on the advantages of Web-enabled direct procurement to develop synergistic business

capabilities. The former (i.e., integrated planning processes) refers to increasing intra-organizational processes integration capability via employing IT resources to streamline order processing and integrate procurement process with the firm's other business processes. The latter (i.e., inter-organizational cooperation) involves increasing inter-organizational processes integration capability via employing IT resources to improve information sharing and mutual adjustment between firms and their suppliers.

6.2 Suggestions for future research

While it can be argued that the results of this study are valid and representative, certain aspects can be addressed in future research. First, the organizational performance measure is subjective in the sense that it was based on Likert-scale responses provided by purchasing managers. Thus, it could also be interesting to include objective performance data (such as financial and other quantitative performance data) to measure competitive advantage. Second, the key informant method was used for data collection. This method, while having its advantages, also suffers from the limitation that the data reflect the opinions of one person. Future studies could consider research designs that allow data collection from multiple respondents within an organization.

Third, previous studies have suggested that contextual factors play an important role in IT business value generation [10][24]. For example, Melville et al. [24] argues that macro factors (i.e., country characteristics) shape IT application and IT business value generation, and industry factors (i.e., industry characteristics) shape the way in which IT is applied within a firm to generate business value. Hence, this study suggests that further research might adopt contextual factors as moderating or mediating variables to evaluate the impact on the performance impacts of Web-enabled direct procurement. A final limitation concerns the static nature of the study. Since this study takes a static (cross-sectional) view of intra- and inter-organizational process integration capabilities, it makes difficult to address the issues of how intra- and inter-organizational process integration capabilities are developed over time and how the impact of intra- and inter-organizational process integration capabilities on organizational performance might change over time. Thus, a longitudinal study could enrich our research findings.

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