

Inter-organizational management capability and competitive advantage: The moderating role of Web-enabled direct procurement

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Abstract: - Developing appropriate inter-organizational management capabilities allow manufacturing firms to strengthen competitive direct procurement advantage. This study investigated the role of inter-organizational management capability for creating competitive direct procurement advantage and how Web-enabled direct procurement moderates the effect of these management capabilities. This study conducted an empirical survey with a valid sample of 191 manufacturing companies to evaluate the research model. The results revealed that monitoring capability, information sharing capability, and supplier alignment capability significantly influence the competitive direct procurement advantage. Moreover, this study observed that Web-enabled direct procurement alone does not directly influence the competitive direct procurement advantage. Web-enabled direct procurement plays a complementary role in reinforcing the effect of inter-organizational management capabilities.

Key-Words: - Competitive direct procurement advantage, Inter-organizational management capability, Monitoring capability, Information sharing capability, Supplier alignment capability, Web-enabled direct procurement

1 Introduction

To address market challenges such as shrinking product life cycles and heterogeneous customer preferences, manufacturing firms have developed various solutions for enhancing their response capacities [3][39]. Establishing direct procurement mechanisms to integrate suppliers' resources is one solution for firms to enhance market responsiveness [6][50]. Direct procurement refers to the processes of acquiring raw materials and subassemblies (i.e., production inputs) from outside sources. Most production inputs are firm-specific critical components that directly contribute to product performance or differentiation [10][35]. Researchers and practitioners concur that implementing Web-based information technology (IT) for supporting direct procurement activities is an effective means to enhance the ability to respond to market changes and customer requests [8][16][51].

Despite considerable progress in Web-enabled direct procurement, at least two opportunities remain. First, little attention has been placed on understanding the inter-organizational management capability from which competitive direct procurement advantage can be created. The literature has addressed what the goals of competitive direct procurement advantages should be (e.g., [21][27][3][34][51][14][22][53][16]); however, less attention has been paid to how these goals can be

achieved. In particular, the literature is silent on which inter-organizational management capabilities should be developed to achieve the competitive advantage goals. In the direct procurement context, inter-organizational management capability is the ability of firms to plan, organize, and control activities pertaining to cooperation with suppliers [10][51]. An understanding of which inter-organizational management capabilities should be developed is valuable for directors of firms who wish to allocate resources to the management capabilities that can create competitive advantage. Hence, this study first addresses the following question: *Which inter-organizational management capabilities are crucial for creating a competitive direct procurement advantage?*

Second, theoretical and empirical research on the interaction effects between Web-enabled direct procurement and inter-organizational management capabilities has been limited. Web-enabled direct procurement is an effective IT-based business solution for improving firms' ability to manage direct procurement and has received considerable attention [8][38][52]. The literature on IT-enabled direct procurement has emphasized how Web-enabled direct procurement contributes to competitive direct procurement advantages (e.g., [17][19][30][32][34][36][51][52]). The literature is silent on how Web-enabled direct procurement shapes the role of inter-organizational management capabilities in creating

competitive direct procurement advantage. An understanding of how Web-enabled direct procurement interacts with inter-organizational management capabilities is valuable for IT managers who wish to improve the fit between IT characteristics (Web-based direct procurement systems) and task characteristics (inter-organizational management). Therefore, this study addresses the second research question: *How does Web-enabled direct procurement moderate the effect of inter-organizational management capability on competitive direct procurement advantage?*

2 Theoretical Background

2.1 Inter-organizational management capabilities required in direct procurement context

Firms can increase their product competitiveness by integrating their suppliers' resources and capabilities [2][13]. Whether the benefits of supplier integration can be achieved depends on how well firms can interact and cooperate with their suppliers in procurement processes [18][53]. Thus, to obtain the benefits of direct procurement, firms have to strengthen the governance of their complex interactions with their direct material suppliers. For example, firms must effectively monitor direct procurement activities to ensure timely fulfillment of their procurement requirements [10][30]. Besides, firms have to coordinate the activities of direct material suppliers to ensure interoperability and seamless process synchronization [3][45]. Direct procurement requires intensive communication and interaction between firms and their direct material suppliers to ensure the alignment of activities. Hence, this study suggests that creating competitive direct procurement advantages requires three critical inter-organizational management capabilities: monitoring capability, information sharing capability, and supplier alignment capability.

Monitoring capability refers to firms' ability to develop monitoring mechanisms to understand how their purchase orders are processed [16][20]. This study argues that the effects of monitoring capability enable firms to effectively supervise the fulfillment of their direct procurement contracts. Because establishing well-defined monitoring mechanisms for direct procurement allows firms to understand how their purchase orders are processed and to review existing purchase order schedules [20][56]. Information sharing capability refers to firms' ability to develop information sharing mechanisms for promoting an accurate information flow between them and their direct material suppliers [8][18]. Effectively establishing information sharing mechanisms in direct procurement context enables firms to better coordinate with their supply partners to

the required terms of delivery, quality, and cost. Supplier alignment capability refers to firms' ability to develop supplier alignment mechanisms for aligning direct materials suppliers' order fulfillment processes with their business requirements [23][53]. Increasing supplier alignment capability allows firms to encourage supply partners to adjust their order fulfillment activities to meet the firms' procurement plans.

2.2 Web-enabled direct procurement

With the advances in information and communication technologies, a number of Web-based IT solutions have emerged that allow firms to conduct business-to-business (B2B) transactions effectively [17][38]. A Web-based B2B system is built on a Web platform using open standards (including communication protocols and data standards) for inter-organizational information exchange [12][50]. The Web-based platform provides a hypermedia network environment in which communication and information exchange constraints can be substantially reduced. The defining feature of a Web-based B2B system is the use of Extensible Markup Language (XML) to form the content platform [54][55]. A Web-based B2B system using XML protocols contains platform-agnostic interpretable metadata about the interface. This platform-agnostic interface allows firms to build a cost-effective system integration infrastructure and create a universal computing environment in which the enterprise systems of the firms and their trading partners can share data [7][25]. The platform nature of a Web-based B2B system enables firms to streamline intra- and inter-organizational processes and to reduce the cost of inter-organizational process integration [30][38].

The emergence of Web-based B2B systems has created a new opportunity for firms to radically improve their procurement processes, and previous studies have found that these systems can improve procurement processes by using a flexible IT platform [43][50]. A Web-based B2B system for direct procurement appears to offer the largest chance of resolving the drawbacks of traditional electronic data interchange (EDI) in procurement transactions [47][56]. Numerous advantages of implementing Web-enabled direct procurement have been reported, such as savings in communication, search, and negotiation costs, the speed and ease of integration of different enterprise systems, and the provision of real-time information about procurement transactions [19][36]. The platform feature of a Web-based direct procurement system allows a firm to improve interactions with direct material suppliers. Increasing interactions with suppliers allows a firm to

effectively implement complex and communication-intensive procurement processes.

Implementing IT functionalities along with the organizational resources to execute business processes enables a firm to develop IT capabilities [37][42]. The functionality of a Web-based direct procurement system is fundamental in determining whether a firm can use the system to improve direct procurement management [34][51]. A suitable Web-based system for conducting procurement activities must support procurement management processes, procurement transactions, and trading partner coordination to achieve an effective procurement life cycle [30][43][50].

3 Research Model and Hypotheses

To address the research questions, this study proposes a research model (Fig. 1) based on the theoretical background. The research model focuses on the role of inter-organizational management capabilities in creating competitive direct procurement advantage. In the direct procurement context, the research model of this study focuses on the monitoring, information sharing, and supplier alignment capabilities. The model considers Web-enabled direct procurement as a factor in creating competitive advantage, and also as a complement to increasing the effect of inter-organizational management capabilities on competitive advantage. The hypothesized relationships derived from the research model are discussed in the following subsections.

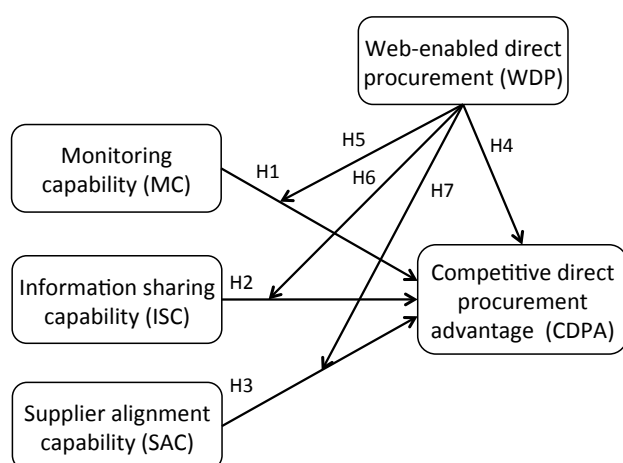


Fig. 1: Research model

3.1 Effect of inter-organizational management capabilities

Enhancing capability in supervising the fulfillment of direct procurement contracts allows firms to improve direct procurement performance [10][28]. Firms with good monitoring capability represents that the firms

can effectively understand how their purchase orders are processed. In enhancing monitoring capability, firms focus on developing monitoring mechanisms to increase their access to information related to the status of purchase orders [46][50]. For example, firms develop the mechanisms that can help them monitor the processing status of their purchase orders and review existing purchase order schedules [16][56].

This study argues that firms can create competitive direct procurement advantage from a superior monitoring capability. According to the RBV, this study suggests that the monitoring capability is a strategic asset in creating competitive advantages because it satisfies the conditions of value, heterogeneity, inimitability, and immobility. The ability to supervise the fulfillment of direct procurement contracts (e.g., monitoring information related to purchase orders) allows firms to benefit from knowing that their purchase orders can be fulfilled as required (i.e., value) [10][28]. Moreover, the ability to implement monitoring mechanism is certainly not equally distributed in the market (i.e., heterogeneity). At the same time, monitoring capability is complex and accumulated over time (i.e., inimitability), and the development of this capability is co-created by firms and their direct material suppliers, who are embedded in the firms' supplier management practices (i.e., immobility). Thus, this study proposes the following hypothesis:

Hypothesis 1 (H1): Firms with a superior monitoring capability have competitive direct procurement advantage over their rivals.

In direct procurement context, firms often need to coordinate direct procurement suppliers' production and logistics schedules to meet their specific procurement requirements. Information sharing improves the coordination between the processes of firms and their supply partners [5][51]. Information sharing refers to the extent to which critical and proprietary information is communicated to trading partners. In enhancing information sharing capability, firms focus on developing information sharing mechanisms to promote timely and accurate information flow between them and their direct material suppliers. For example, firms develop information sharing mechanisms that can keep them and their supply partners informed in advance of changing needs and work together to solve problems [8][23].

Firms can create competitive advantage through superior information sharing capability. Being able to establish robust information sharing mechanisms between firms and supply partners enables the firms to cope with market changes (i.e., value). Moreover, the

ability to implement information sharing mechanisms to coordinate the supply partners' activities is certainly not equally distributed in the market (i.e., heterogeneity). At the same time, information sharing capability is complex and accumulated over time (i.e., inimitability), and it is developed through a series of social exchanges between firms and their supply partners (i.e., immobility). Thus, this study proposes the following hypothesis:

Hypothesis 2 (H2): Firms with a superior information sharing capability have competitive direct procurement advantage over their rivals.

The integrated business processes between firms and their supply partners are a critical factor in the firm's ability to manage direct procurement, and these processes depend significantly on whether the firms can effectively align their supply partners to meet their requirements [3][18]. A high degree of supplier alignment means that supply partners' activities are coordinated as they are carried out through closely interaction. In improving supplier alignment capability, firms have to develop supplier alignment mechanisms to increase the alignment of supply partners' order fulfillment processes with their business requirements. For example, firms develop supplier alignment mechanisms that can synchronize the output of supply partners' order fulfillment work with their production plans, thus allowing their production strategies such as the just-in-time strategy, to be achieved [23][53].

Firms can create competitive direct procurement advantage through superior supplier alignment capability. Being able to establish robust supplier alignment mechanisms (e.g., aligning of supply partners' order fulfillment processes with the firms' business requirements) enables firms to cope with market changes (i.e., value). Moreover, the ability to implement supplier alignment mechanisms to coordinate the supply partners' activities is certainly not equally distributed in the market (i.e., heterogeneity). At the same time, supplier alignment capability is complex and accumulated over time (i.e., inimitability), and the development of this capability is co-created by firms and their supply partners, who are embedded in the firms' supplier management practices (i.e., immobility). Thus, this study proposes the following hypothesis:

Hypothesis 3 (H3): Firms with a superior supplier alignment capability have competitive direct procurement advantage over their rivals.

3.2 Moderating role of Web-enabled direct procurement

In direct procurement context, Web-based direct procurement system allows firms effectively to conduct inter-organizational management activities. The electronic processing of inter-organizational trading data improves the timeliness and accuracy of information, leading to greater efficiency in procurement processes [30][38]. In this study, we suggest that Web-enabled direct procurement allows firms to create a suitable environment for effectively conducting direct procurement activities, leading to competitive advantage. These gains are derived from using Web-based direct procurement systems to place, confirm, and track orders with suppliers, and from allowing direct material suppliers to manage product catalogs online (i.e., value) [34][36]. Moreover, the ability to implement Web-enabled direct procurement is not equally distributed in the market (i.e., heterogeneity). The knowledge of how to implement Web-enabled direct procurement is complex and accumulates over time (i.e., inimitability) [17][51], and is deeply embedded in the firm's IT implementation practices (i.e., immobility). Thus, the following hypothesis is proposed:

Hypothesis 4 (H4): Firms with a superior Web-enabled direct procurement have competitive direct procurement advantage over their rivals.

Firms derive many benefits from Web-enabled direct procurement, such as improved coordination and enhanced relationships with suppliers [34][36]. Conducting inter-organizational management in direct procurement context by using Web-based IT enables firms to refine their relationships with suppliers and strengthen the mechanisms for coordination with suppliers [8][18]. This study suggests that Web-enabled direct procurement can be employed to improve firms' monitoring, information sharing, and supplier alignment capabilities through complementary effects.

Web-enabled direct procurement is a significant enabler of monitoring capability. Implementing Web-based B2B systems allow firms to effectively administer procurement by enabling the firms to access information related to purchase orders [19][38]. Effectively monitoring information related to purchase orders is critical for firms to ensure their purchase orders are processed correctly [10][16]. This study argues that Web-enabled direct procurement provides firms an effective way to establish comprehensive monitoring mechanisms that allow them to review existing purchase order schedules and to understand how their purchase

orders are processed [6][36]. Thus, this study proposes the following hypothesis:

Hypothesis 5 (H5): Web-enabled direct procurement moderates the effect of the monitoring capability on competitive direct procurement advantage.

Many companies which have implemented Web-based IT have experienced benefits in improved inter-organizational information sharing [37][43]. Implementing Web-based IT in the transactions of direct procurement promotes the sharing of information between firms and their supply partners. Web-based IT platform makes it easier for trading parties to establish information sharing in that information can be exchanged at multiple levels [8][21][34]. Implementing Web-enabled direct procurement may result in increasing levels of unidirectional and bidirectional information flows between trading parties. According to the above arguments, this study suggests that Web-enabled direct procurement can be regarded as an enabler of information sharing capability. Thus, the following hypothesis is proposed:

Hypothesis 6 (H6): Web-enabled direct procurement moderates the effect of the information sharing capability on competitive direct procurement advantage.

Web-based IT for direct procurement capitalizes on rich media interfaces and hypermedia architectures, enabling the sharing of more complex information [19][51]. The information exchange platform provided by Web-enabled direct procurement allows firms to interact with their supply partners intensively, thus improving the alignment of direct material suppliers' order fulfillment activities with firms' procurement plans. Web-based IT helps firms improve comprehensive information flows with their suppliers, with data flowing more accurately and more frequently across firm boundaries, thus raising the degree of supplier alignment in inter-organizational coordination [7][17]. As a result, the firms can efficiently coordinate their supply partners' decisions and activities, thus achieving true integration. Implementing inter-organizational coordination on a Web-based IT platform 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 [38][51]. According to the above arguments, this study suggests that Web-enabled direct procurement can be regarded as an enabler of supplier alignment capability. Thus, the following hypothesis is proposed:

Hypothesis 7 (H7): Web-enabled direct procurement moderates the effect of the supplier alignment capability on competitive direct procurement advantage.

4 Research Methodology

4.1 Measures

To construct a pool of items to measure the latent constructs, several tests were administered in stages. We began by developing a structured questionnaire for measuring the first-order latent constructs in our research model. The structured questionnaire was developed in the following stages: (a) the development of a draft version based on a literature review, (b) a review of the draft by invited academics and practitioners (the content validity panel), and (c) refinements to the questionnaire. All construct items were evaluated using 7-point Likert-type scales.

This study measured Web-enabled direct procurement on a 4-item scale adapted from the literature on Web-based inter-organizational systems and procurement systems (e.g., [8][12][15][34][36][38][50][51]). These measures asked respondents to evaluate their firm's ability in using a Web-based direct procurement system to manage direct procurement activities. Specifically, Web-enabled direct procurement was operationalized using items indicating the extent to which firms used a Web-based direct procurement system to assist in (a) transmitting purchase orders, (b) inquiring about the progress of a direct procurement, (c) confirming orders with direct material suppliers, and (d) negotiating with direct material suppliers.

This study measured monitoring capability on a 4-item scale adapted from the literature on procurement management and supplier management (e.g., [6][10][16][20][50]). These measures asked respondents to evaluate their firm's ability to develop monitoring mechanisms to understand how their purchase orders are processed. Specifically, monitoring capability was operationalized using items indicating the degree to which firms can (a) obtain the information about the progress of direct procurement, (b) understand how our purchase orders are processed, (c) access information related to the status of purchase orders, and (d) review existing purchase order schedules.

This study measured information sharing capability and supplier alignment capability each on a 4-item scale adapted from the literature on supply chain management and inter-organizational coordination (e.g., [8][12][18][23][49][51][56]). The information

sharing capability reflected the ability to develop mechanisms for promoting an accurate information flow between the focal firm and its direct material suppliers. The supplier alignment capability reflected the ability to develop mechanisms for aligning the direct materials suppliers' order fulfillment processes with the focal firm's business requirements. Specifically, the information sharing capability was operationalized using items indicating the degree to which firms and their direct material suppliers (a) informed each other in advance of changing needs, (b) exchanged timely information, (c) provided any information to each other that might help the other party, and (d) kept each other informed about events that may affect the other party. The supplier alignment capability was operationalized using items indicating the degree to which (a) the direct material suppliers' order fulfillment processes could be aligned with the focal firm's requirements, (b) the direct material suppliers were willing to adjust their business processes to meet the focal firm's requirements, (c) the direct material suppliers' order fulfillment work could be synchronized with the focal firm's production plans, and (d) the work tasks between the focal firm and its direct material suppliers could fit together well.

To measure the competitive direct procurement advantage, this study used four items adapted from the literature on procurement management and supply chain management (e.g., [31][42][48][50][57]). These measures asked respondents to evaluate their firm's ability to create strategic advantage over their rivals in direct procurement management. Specifically, the competitive direct procurement advantage was operationalized using items indicating the extent to which firms had a higher performance than their key competitors in (a) reducing production lead times, (b) dealing with demand uncertainties, (c) responding to market demands, and (d) lowering the inventory costs of direct materials.

Finally, to ensure the content validity of the scales, the selected items must accurately represent the concept about which generalizations are to be made. Therefore, a content validity panel was convened to reconsider the items collected from previous studies to determine the applicability and semantics of each item. The panel members in this study consisted of seven managers from manufacturing firms in Taiwan and three professors (not including the authors) whose research focuses on supply chain management and information 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 [26] that the CVR of each item must exceed or equal 0.62. Useful comments were incorporated to measure the five constructs of the research model of this study.

4.2 Data collection

A mail survey was conducted to collect data from 500 randomly selected manufacturing firms in Taiwan based on the directories of the Fortune 1000 manufacturers in Taiwan, published in May 1 2011 by CommonWealth Magazine. Key informant method was used and only purchasing managers of the firms were requested to respond to the questions. Previous studies argue that key informants as appropriate respondents if chosen based on the key informants' knowledge of the research issues and their formal role in the organization [4][24]. The key factor in respondent (i.e., informant) 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.

This survey, which yielded 228 responses, was available for eight weeks. Once incomplete responses and missing values had been removed, a sample of 191 valid responses was obtained (38.2% valid response rate). The sample included different types of businesses, with 53.9% of the firms from the computer system and electronics industries, reflecting the significance of the two sectors in Taiwanese manufacturing. This study found that the sample consisted of medium- to large-sized firms, but mainly medium-sized firms. Moreover, the average work experience (i.e., purchasing management) of employees was 5.71 years in their current position, indicating adequate informant knowledge.

5 Data Analysis and Results

The method of partial least squares (PLS) was used to test the hypothesized relationships among the study variables shown in Fig. 1. Data analysis by PLS was performed with SmartPLS 2.0 (M3) software [41].

5.1 Evaluating the measurement model

The measurement model was assessed via PLS to determine individual item reliability, internal consistency reliability and convergent and discriminant validity. This study assessed individual item reliability by examining the loading of each item to its respective construct. Table 1 shows that all item loadings are above 0.79 (ranging from 0.791 to 0.915), which is

higher than the 0.707 threshold, indicating that more than half of the variance is captured by the constructs. The internal consistency reliability of each construct was assessed by Cronbach's alpha and composite reliability (CR). A score of 0.70 or above is an acceptable value of internal consistency for exploratory research [1]. Table 1 shows the Cronbach's alpha (ranging from 0.842 to 0.906) and CR values (ranging from 0.869 to 0.925) for each construct. All indicators are above the recommended level of 0.70, indicating adequate internal consistency.

Table 1: Factor loading and reliability

Construct / Item	Factor loading	Cronbach's Alpha	Composite Reliability (CR)
WDP		0.861	0.885
WDP1	0.869		
WDP2	0.826		
WDP3	0.843		
WDP4	0.809		
MC		0.896	0.917
MC1	0.854		
MC2	0.878		
MC3	0.883		
MC4	0.875		
ISC		0.877	0.903
ISC1	0.885		
ISC2	0.859		
ISC3	0.824		
ISC4	0.841		
SAC		0.906	0.925
SAC1	0.852		
SAC2	0.887		
SAC3	0.869		
SAC4	0.915		
CDPA		0.842	0.869
CDPA1	0.849		
CDPA2	0.808		
CDPA3	0.791		
CDPA4	0.825		

Table 2 shows the average variance extracted (AVE) and the square root of the AVE, along with the correlations between the constructs. Convergent validity is considered adequate when the AVE values pertaining to each construct are higher than the suggested threshold value of 0.50, and this condition was satisfied in all cases (with actual values ranging from 0.695 to 0.761). A construct is considered to be distinct from others if the square root of its AVE is greater than its correlations with other latent constructs [1]. As shown in Table 2, comparison of 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, thus supporting discriminant validity.

Table 2: Convergent and discriminant validity

Construct	AVE	1	2	3	4	5
1. WDP	0.701	0.837				
2. MC	0.761	0.371	0.872			
3. ISC	0.735	0.395	0.405	0.857		
4. SAC	0.758	0.367	0.389	0.496	0.871	
5. CDPA	0.695	0.079	0.293	0.461	0.489	0.833

Note: *Diagonal elements (bold) are the square roots of AVE by latent constructs from their indicators. AVE: $\Sigma(Li^2)/[\Sigma(Li^2) + \Sigma(Var(Ei))]$, Li = factor loading, $Var(Ei)$ = error variance*

5.2 Testing the structural model

This study assessed PLS structural model and hypotheses by examining the path coefficients and their significance levels. Two structural models were built to estimate this study's hypotheses involving moderating effects. The first model contained only main effects and allowed for the testing of H1, H2, H3 and H4. The second model added the interactive effects of Web-enabled direct procurement to the three inter-organizational management capabilities, which allowed for the testing of H5, H6 and H7. The PLS results are shown in Table 3.

Table 3: Results of PLS models

Hypothesis	Exogenous variables	Model 1	Model 2
H1	MC	0.219 (2.015)*	0.183 (1.997)*
H2	ISC	0.304 (2.243)*	0.272 (2.016)*
H3	SAC	0.317 (2.959)**	0.289 (2.682)**
H4	WDP	0.171 (1.831) ^{ns}	0.085 (1.004) ^{ns}
H5	WDP*MC		0.161 (1.971)*
H6	WDP*ISC		0.178 (1.993)*
H7	WDP*SAC		0.176 (1.985)*
R2		0.423	0.518
ΔR^2			0.095
F values			0.167*

The first model (Model 1) tested for the impact of Web-enabled direct procurement and inter-organizational management capabilities on competitive

direct procurement advantage. The results shown in Model 1 of Table 3 provide strong evidence for hypotheses 1 to 3, but no evidence for hypothesis 4. Three inter-organizational management capabilities have significantly positive effects on competitive direct procurement advantage. The path coefficients are 0.219 (t-value = 2.051 > 1.962, p-value < 0.05), 0.304 (t-value = 2.243 > 1.962, p-value < 0.05) and 0.317 (t-value = 2.959 > 2.581, p-value < 0.01), respectively. Hence, in terms of the RBV, monitoring, information sharing, and supplier alignment capabilities can be considered to be distinctive capabilities, which are able to explain performance heterogeneity, thus representing three important sources of a competitive direct procurement advantage.

However, from Model 1, this study found that Web-enabled direct procurement can not significantly influence competitive direct procurement advantage. The path coefficient is 0.171 (t-value = 1.831 < 1.96, p-value > 0.05), which means that Web-enabled direct procurement is not able to directly influence competitive direct procurement advantage. This finding may result from the fact that information systems are, by themselves, typically imitable [33][40]. Hence, this study suggests that Web-enabled direct procurement alone cannot satisfy the long-term performance heterogeneity condition (i.e., competitive advantage).

The second model (Model 2) contains interaction effects between Web-enabled direct procurement and the three inter-organizational management capabilities. In PLS, the magnitude of interaction effects can be evaluated through a hierarchical procedure similar to that employed for ordinary least squares (OLS) regression, where the explained variance R^2 (i.e., explanatory power) of the model with the main effects is compared to that of the full model (considering both main effects and interactions) (Chin et al. 2003). Model 2 confirms H5, which assumes a moderating effect of the Web-enabled direct procurement on the relationship between monitoring capability and competitive direct procurement advantage. The path coefficient is 0.161 (t-value = 1.971 > 1.962, p-value < 0.05). H6 is also confirmed by our analysis because the interactive term between information sharing capability and Web-enabled direct procurement has a significantly positive effect on competitive direct procurement advantage. The path coefficient is 0.178 (t-value = 1.993 > 1.962, p-value < 0.05). H7 is also confirmed by our analysis because the interactive term between supplier alignment capability and Web-enabled direct procurement has a significantly positive effect on competitive direct procurement advantage.

The path coefficient is 0.176 (t-value = 1.985 > 1.962, p-value < 0.05).

Furthermore, the effect size of interaction in Model 2, calculated as $f = (R^2_{\text{Full}} - R^2_{\text{main}}) / (1 - R^2_{\text{main}})$, is $f = 0.167$, and can be interpreted as a 'medium to large' effect [11]. We find that the F-test for the increase in R^2 from 0.423 to 0.518 when interactive terms (Web-enabled direct procurement*monitoring capability, Web-enabled direct procurement*information sharing capability, and Web-enabled direct procurement*supplier alignment capability) were added to the model is significantly different from zero (p-value < 0.05). Hence, the Web-enabled direct procurement can be considered a complementary factor that can increase firms' monitoring capability, information sharing capability, and supplier alignment capability.

6 Conclusion

Through an empirical study of 191 manufacturing firms, this study found that firms could create competitive direct procurement advantage if the firms have superior monitoring capability, information sharing capability, and supplier alignment capability. Although there is no empirical support for the direct effect of Web-enabled direct procurement on the competitive direct procurement advantage, there is empirical support for the positive moderating effects of Web-enabled direct procurement.

6.1 Implications for researchers and practitioners

This study identified three essential inter-organizational management capabilities (i.e., monitoring capability, information sharing capability, and supplier alignment capability) that contribute to creating competitive direct procurement advantage. Although previous studies have investigated competitive direct procurement advantage goals, they have paid less attention to the inter-organizational management capabilities that are crucial for creating the competitive advantage. In order to fill the gap, this study investigated what the inter-organizational management capabilities required in direct procurement context, and subsequently analyzed how such management capabilities affect the competitive direct procurement advantage.

Another implication of this study is related to the role of Web-enabled direct procurement in creating competitive direct procurement advantage. This study developed and tested a conceptual model for assessing the direct and moderating effects of Web-enabled direct procurement on 191 manufacturing firms from various sectors. This study found that Web-enabled direct procurement does not directly influence competitive direct procurement advantages. However,

in evaluating the moderating effects, this study found that Web-enabled direct procurement plays a crucial complementary role in reinforcing the effect of inter-organizational management capabilities on competitive direct procurement advantages.

This study also provides practical implications for managers. The findings of this study confirm that firms should be aware that inter-organizational management capabilities could be strengthened through Web-enabled direct procurement. This study suggests that firms consider whether their Web-enabled direct procurement solutions enable them to develop comprehensive monitoring mechanisms, establish robust information sharing mechanisms, and synchronize production plans with the output of suppliers' order fulfillment work. The first capability (i.e., developing comprehensive monitoring mechanisms) refers to strengthening monitoring capability by implementing Web-enabled direct procurement to increase access to information related to the status of purchase orders. The second capability (i.e., establishing robust information sharing mechanisms) refers to strengthening the information sharing capability by using Web-enabled direct procurement solutions to develop mechanisms for promoting an accurate information flow between the firms and their direct material suppliers. The third capability (i.e., synchronizing production plans with the output of suppliers' order fulfillment work) refers to strengthening the supplier alignment capability by using Web-enabled direct procurement solutions to develop mechanisms for aligning supplier order fulfillment processes with the firms' business requirements.

6.2 Suggestions for future research

Although the proposed research model was based on theoretical inference and was tested through an empirical survey, two limitations should be taken into consideration when generalizing the results of this study. First, this study used a key informant method for data collection. There are many advantages to this method. The method can be performed in a short time and the key informant is useful for reaching target respondent groups [29][44]. However, this method has the limitation that the data reflect the opinions of one person. Future studies should consider research designs that allow for data collection from multiple respondents within an organization. Second, the competitive direct procurement advantage is subjective in the sense that it is based on the responses of purchasing managers to a Likert scale. Thus, it would be more objective to obtain and analyze actual performance data (such as financial and other quantitative performance data) to measure competitive direct procurement advantage.

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