How does procurement capability maturity affect e-Procurement adoption and leverage purchasing in supply chain

Pongpanga Pongsuwan
National Institute of Development Administration
Bangkok, Thailand

Abstract

This study refers to the research model of Batenburg (2008) which defined procurement functions to six maturity dimensions; strategy, processes, control, organization, information, e-Technology as the starting point and indicates twenty two items to support capability maturity measurement which is called "Procurement Competitive Capability Maturity"(PCCM). This model is used for a company to assess current practices of procurement function and perceives the level of its capabilities. The data collection is from a survey of fifty-two selected procurement organizations in Southeast Asia (SEA) countries; from Thailand, Vietnam, Philippines, Indonesia, Malaysia and Singapore. The objective of this study is to demonstrate the significant value of industry type, size of spending and centralized/decentralized procurement that affect procurement capability maturity. The results show that the industry has no relation to the capability maturity; the size of procurement spend has a positive relation to the capability maturity; and the centralized procurement has higher capability maturity than the decentralized. Moreover, this study extends the knowledge of e-Procurement and digital context to leverage procurement processes and visible procurement integration in an organization and across the supply chain.

1. Introduction

Procurement is defined as "All activities that are required in order to get the product/service from the supplier to its final destination" (Well Van Weele,2004). Procurement refers to a process in which organizations establish agreements for the acquisition of goods or services (contracting) or purchase of goods or services in exchange of payment (purchasing) (Robinson et al, 2010, Rolstadas et al, (2011). Spend on average at least one third of the budget on acquiring goods and services (Segev et al, 1998),therefore procurement has a key role of cost saving in an organization. Procurement is an important strategic function rather than as an operational function (Peter Kraljic,1983). Procurement attempted to transform to a strategic function and leverage technology to drive a greater value and make differentiation of suppliers. Today's technology provides a new channel for procurement to achieve its objectives and be more efficient in managing transactions and processes. According to the internet technology, ithas migrated procurement from paper based to e-Procurement processes; sourcing of buyers and sellers, a digital catalogue of products, online bidding, ordering, payments, goods dispatching notices, logistics and supply chain management (Thomson & Singh, 2001).

In 2015, the establishment of four pillars of ASEAN Economic Community (AEC),creating a single market and production base, increasing competitiveness, promoting equitable economic development, and integrating into the global economy (http://aseanup.com/benefits-asean-economic-community-aec). This leads to an increased number of competitors, strengthens relativity of competitors, increases level of demand and supply, and eases the competitors into the market. The consequence is that procurement functions may struggle with the negotiation of low cost contracts and a broader of strategic role in the competitive environment. This requires procurement to find a new/different approach of

purchasing products and services to ensure that the company receives the best value for their money. Capable procurement should provide value not only for internal functions, but also for external functions of suppliers and customers. Moreover, organizations must have comprehensive visibility into supply chain performance to maximize competitive advantage (Croom and Johnson, 2003). With the fast growing technological needs, procurement functions have to adapt them properly in order to improve communications, collaboration, analytic reports, and applications along P2P processes. It is therefore essential to explore the factors which determine the relationship perspective to the capability maturity and how to improve the performance in the functions in order to extend procurement value in the supply chain.

The outline for this paper is to introduce the background and to theoretically follow with research questions and the research model. Subsequently, the outline will present the results of significant relationships of industry, size of procurement spend, and centralized/ decentralized procurement that influences the capability maturity in procurement organization. Then the last session proposes the conclusion, contributions, limitations, and directions for the future research.

2. Theory and Research model
2.1 Procurement Maturity

Procurement maturity is viewed as a broad and aggregated concept of organization structures, strategies, supplier relationships, internal processes and systems (Van Weele, 2010). Maturity of procurement is referred to "the level of professionalism in the purchasing function" (Rozemeijer et al., 2003).Maturity levels indicate an organization's current (or desirable) capabilities in regards to a specific class of entities (Rosemann and de Bruin, 2005). Maturity models are commonly applied to assess the as-is situation, to derive and prioritize improvement measures, and to control progress (Iversen et al., 1999) also to establish auditable, cumulative stages which require the order from purchasing function to achieve a greater level of sophistication, typically from a process orientation through to a strategic value-based contribution (Rozemeijer et al., 2003; Schiele and McCue, 2006).

In this study the Procurement Competitive Capability Maturity (PCCM) framework is applied for *as-is* assessments where the current capabilities of organization can be assessed with the respect to the given criteria. In this model, there is an initial stage of procurement capability building a foundation to a final stage of excellence. The indicative of capability maturity in each stage shows in the Table 1as below;

	Foundation - *stage 1*	Established - *stage 2*	Leading — *stage 3*	Excellence — *stage 4*
Org.	Success of the capabilities depends on certain specialist	Procurement knowledge is performed, but lacks of cross-functional team	Procurement functions work as cross functional team	Practice knowledge is very high and leads to competitive advantage
Process	No measurement and performance adjustment	Foundation capabilities with business processes, methods and projects are becoming more formalized	Operating models and skills alignment to practice are seeded	Processes are analyzed optimized and adjusted to changes in market requirement systematically
Strategy	At the basic level with phone and fax considered the primary tools	A process for conducting basic sourcing events likely via emails with spreadsheet	Business process capabilities are integrated with blend of methods, tools and technologies	Procurement goal's, metrics are part of the daily life and become visibility across the enterprise
Information	Quality and cost of efforts are not predictable at all times	Basic spend analysis likely spreadsheet basis	Proper spend analysis using business intelligence across business units, regions	Benchmarking and leading practice are continuously used to identify improvement potential
Monitor	Seldom perform supplier performance on paper basis	Perform supplier assessment for risk, performance capability likely managed via	Supplier networks integrated into the sourcing solutions to improve company supplier base	Supplier networks integrated into the sourcing solutions to improve company supplier base
e-Technology	Basic technology and platform components are in place, store record in paper base	Basic technology and platform components are in place, likely on premise ERP solution	E-procurement used to reduce paper, Po and invoices to a bare minimum	Integrated source to pay (S2P) into cloud online via web browser

Table 1: Four stages of Procurement Competitive Capability Maturity (PCCM)

2.2 e-Procurement

e-Procurement is a comprehensive approach using electronic tools to manage procurement activities and streamline process efficiency between organization and its suppliers. e-Procurement is defined as using internet technology in the purchasing process excluding old applications like ordering by telephone or by fax (De Boer, 2002). The use of information technology in the procurement process (Abu-Elsamen, Chakraborty, & Warren, 2010: Garrido, Gutierrez, & Jose, 2008; Gunasekaran & Ngai, 2008). e-Procurement helps a company to reduce business costs (Gunasekaran & Ngai, 2008), to reduce purchasing time (Lefebvre, Elia, &Boeck, 2005)to streamline purchasing processes (Teo, Lin, & Lai, 2009). In addition, it enables "just in time" strategy, streamlining of the supply chain by removal of inefficient intermediaries, better access to information and transparency and removal of market barriers like time difference and geography (Leonard and Cochran, 2003). Moreover, it creates a higher profile for supply management and boots its visibility to top management (Presutti, 2003).

A properly implemented e-Procurement system will connect company and business processes directly with suppliers while managing all interactions between them (Giner et al., 2011). Since the late 1990's, the rise of e-business and new opportunities related to procurement: e-Procurement, spend management, outsourcing, joint product design, and more (Lacione& Smith & Oliva 2000). Incrementally improving technology utilization for automation will increase in cost savings of sourcing from 3.2 % to 7.4% (Aberdeen Group, Spend Analysis, page 16, August 2007). As companies go forward in 2020, Procure-to-Pay (P2P), sourcing, contract management and other automation engines will be de rigueur; they will be integrated up and down supply chains, fully adopted, providing full transparency and real-time insight (Vision 2020, October 2013).

2.3 Research Model

This study develops "Procurement Competitive Capability Maturity "model as shown in Figure 1. The model is applied to assess the current capabilities in procurement organization referred to Table 2.
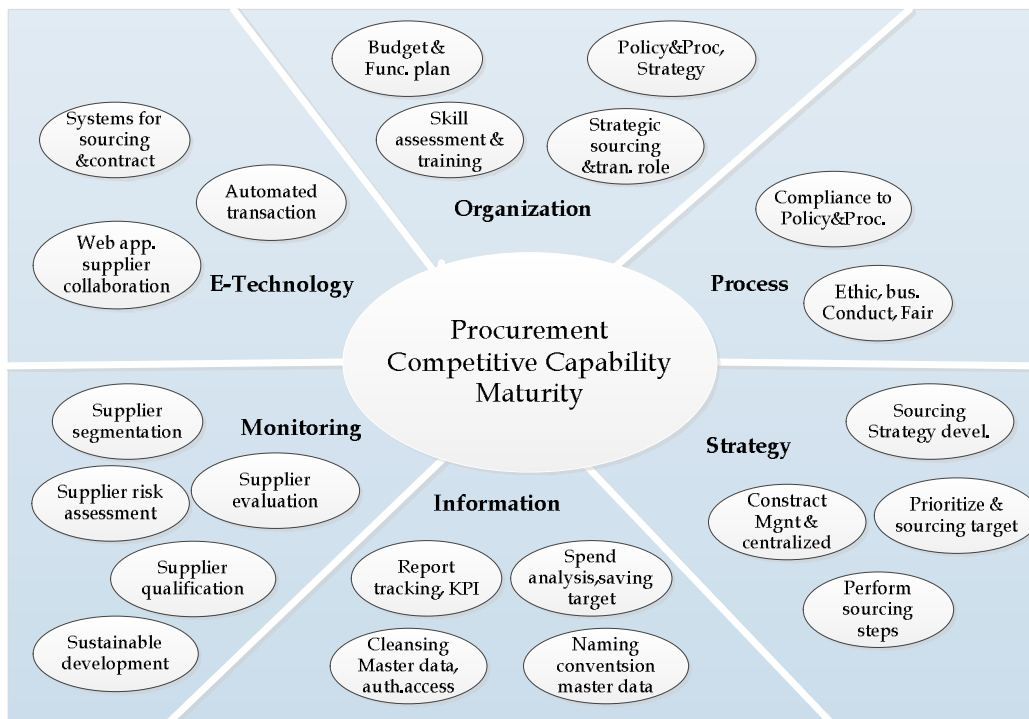

Figure 1: PCCM model with the indicators of capability maturity in each dimension

			Dimensions	Level of procurement capability maturity (score from 1-4)			
				Foundation 1	Established 2	Leading 3	Excellence 4
Industry Type	*Size of Spending*	*Centralized/Decentralized*	Organization				
			Process				
			Strategy				
			Information				
			Monitoring				
			e-Technology				

Table 2: PCCM framework with the levels of procurement capability maturity

The focus group is procurement organizations in Southeast Asia which include Thailand, Philippines, Vietnam, Indonesia, Singapore and Malaysia. Score is given by perceptions of the respondents from an online survey. Table 3 shows the aspects of PCCM model and criteria for measurement.

Dimension	Measurement
1 Organization	What is your skills and operating model to drive leading process in procurement
2 Process	How is your procurement in line with the process
3 Strategy	What is your performance in strategic procurement
4 Information	What is your visibility in spend analysis and key performance
5 Monitor	How good is your supplier management
6 e-Technology	How good is your deployment and adoption of technology

Table 3: Criteria for measurement in PCCM model

This is an empirical study and adopts a quantitative approach which draws inferences from the findings on relationships of capability maturity/performance and independent variables; industry type, size of spending, centralized/decentralized procurement.

Result of assessment shows the capabilities of procurement function in addition to benchmarking with the others. As a result, it will be beneficial for a procurement organization to use as a guideline to formulate an effective in procurement process, strategy and organization.

3. Research questions
3.1 Problem statement:

Today there is a highly competitive and rapidly changing technological environment; therefore, only businesses that are responsive, adaptable and flexible will thrive. Consequently, it is necessary for a company to enable procurement agility due to its involvement in the majority of the spending activities and cost savings for the company. Thus the study is interested in procurement function and attempts to explore significantly the value of industry, size of spend and centralized/decentralized procurement that influences capability maturity, including a dynamic view of procurement maturity. Additionally, there is no research framework that applies-Procurement systems to the digital context along a supply chain.

Our research questions:
RQ1: Is there a significant relationship between capability maturity and industry type?
RQ2: Is there a significant relationship between capability maturity and size of procurement spend?

RQ3: Is there a significant relationship between capability maturity and centralized/decentralized procurement?

In this study centralized procurement(regional) is defined as the control in policy & procedure, purchasing & sourcing by a central/regional team, but allows procurement functions in a local country for flexibility to find products and suppliers that best match to their needs; Decentralized procurement(local) is defined as the control policy & procedure, purchasing & sourcing performed by its own entity/country.

4. Data Collection
4.1 Data Analysis:

The reliability of measurement scales are determined by analysis of internal consistency and Cronbach's coefficient alpha (α) test. The threshold value of coefficient alpha 0.70 or above is sufficient for a measure to be acceptable (Nunnally,J.C., 1978). In this study, Cronbach's coefficient alpha (α) =.95 which exceeds the minimum threshold value.

Data collection is from anon line survey with the follow up interview of fifty two companies consisting of twenty two questions related to capability maturity of procurement. Each question was scored on a four-point scale with Foundation = 1, Established=2, Leading and=3,and Excellence=4. The indicative in each capability maturity refers to Table 1. High score means high capability maturity. This study infers high maturity is high performance from the finding of "A positive relation of procurement maturity and performance" (Batenburg and Versendaal, 2008).

Variables:

Dependent variables the determinant of capability maturity in procurement function. Independent variable is the explore determinant of industry type, size of spend and centralized/decentralized procurement that affect to capability maturity in procurement.

Table 4 shows the data profile of this study by industry type, size of spend (in million $ US) and procurement strategy of centralization and decentralization.

Industry type	Procurement Spend $			Procurement Strategy	
	< 50	50 -200	> 200	Centralized	Decentralized
Manufacturing	4	4	5	4	9
Consumer Products	4	4	5	7	6
Retails	4	4	5	8	5
Food&Beverage	4	4	5	8	5
Total	16	16	20	27	25

Table 4:Data profile

5. Results

From the study the result of significant value as is shown below

R1: Procurement capability maturity is not significantly different by industry

R2: Procurement capability maturity is significantly different by procurement spend

R3: Procurement capability maturity is significantly different by procurement centralized/decentralized structure

In summary, procurement capability maturity has no relation to the industry type, but it depends on size of spend and centralization/decentralization of procurement structure. Thus this study has furthered the investigation of the relation of procurement spend and centralized/decentralized structure to the capability maturity in a procurement organization with regardless of the industry.

Figure 2showsthat the larger spending has a higher capability maturity/ performance in all dimensions than the smaller spending. The average score on the e-Technology has the least score compared to other dimensions.
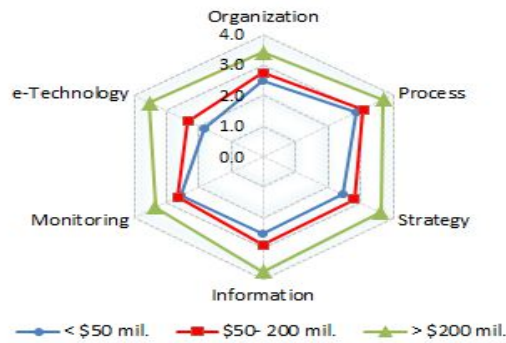

Figure 2:Compare and benchmark by procurement spend

Figure 3 shows that centralized procurement (Regional) has a higher capability maturity/ performance than decentralized procurement (Local) in all dimensions of capability maturity. Also e-Technology has the least score compared to other dimensions.
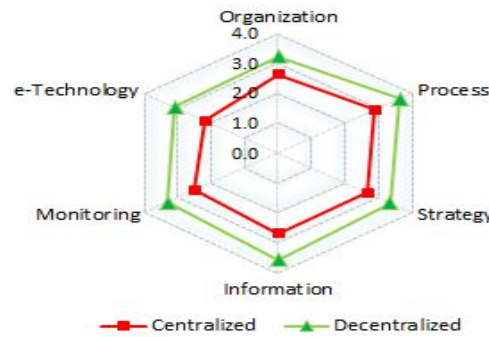

Figure 3: Compare and benchmark by centralized/decentralized procurement

Table 5 shows the average score in each of the six dimensions of capability maturity, with the assumption that each dimension has equal weight. The highest score is the process 3.26, monitoring and e-Technology is 2.88, 2.61 respectively. It concludes that procurement functions mainly develop on the process dimension. E-Procurement systems only support for the operational transaction, not for sourcing activities along with P2P process. In addition, there are the possible areas for improvement in the region.

	Mean
Organization	2.91
Process	3.26
Strategy	3.00
Information	3.11
Monitoring	2.88
e-Technology	2.61

Table 5: The mean score of procurement capability maturity

Table 6shows the average capability maturity score detailed in six dimensions. This represents the capability maturity status of procurement functions in this region.

Dimension	Item	Mean	SD
Organization:		2.91	0.70
	Operating Budget & Functional Plan	3.13	0.66
	Policies and Procedures & Strategy	2.65	0.95
	Strategic Sourcing & Transactional role	2.87	0.99
	Skill Assessment & Training	2.98	1.11
Process:		3.26	0.70
	Compliance to Policies and Procedures	3.15	0.67
	Ethics, Bus. Conduct & Fair Competition	3.37	0.93
Strategy:		3.00	0.78
	Sourcing Strategy Developed	2.96	1.01
	Prioritized and Sourcing Targets	2.88	1.08
	Contracts Management & Centrally store	3.13	1.01
	Perform Sourcing steps	3.02	1.08
Information:		3.11	0.85
	Spend Analysis, Savings lever & Benefit targets	2.83	1.13
	Report Tracking Performance and KPI's	3.29	0.91
	Cleaning Master Data & Authorization Access	3.21	1.02
	Naming Convention of material master	3.10	1.09
Monitoring:		2.88	0.75
	Supplier Performance Evaluation	3.10	0.91
	Supplier Qualification/ Assessment	3.23	0.67
	Supplier Segmentation	2.44	1.09
	Supplier Risk Assessment	2.52	1.20
	Sustainable Development with supplier	3.10	0.93
E-Technology:		2.61	1.08
	Automated transaction	2.50	1.26
	Systems for Sourcing Activities & Contract	2.90	1.07
	Web Application for Supplier Collaboration	2.42	1.32

Table 6: Shows the detail scores in each capability maturity of six dimensions

The study has extended the knowledge of PCCM model with the digital technology. "Procurement Digital Framework" (PDK) is defined and depicted as shown in Figure 4.It shows the six dimensions of PCCM, Procure to Pay (P2P), e-Procurement systems and digital context in a framework in order to leverage procurement processes and visible procurement integration in an organization and across the supply chain.
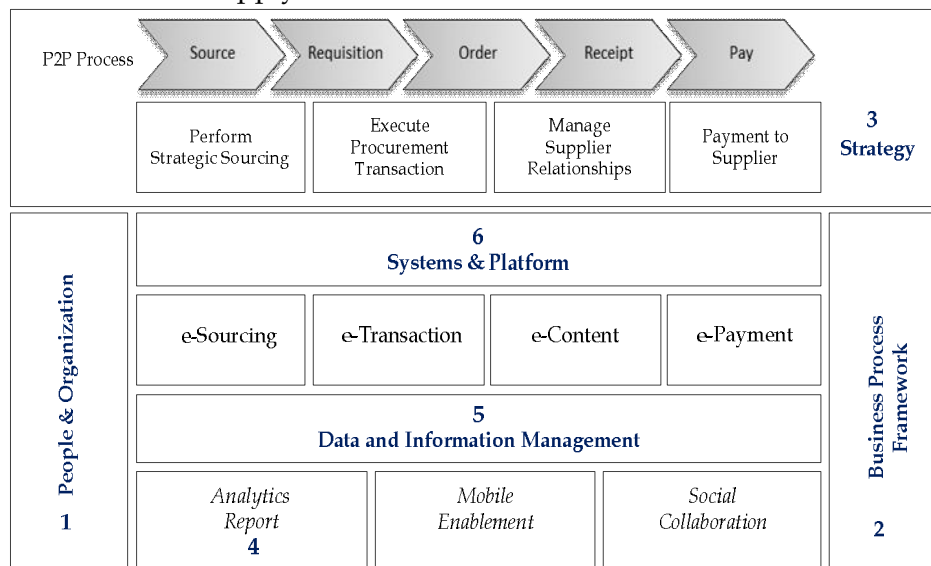

Figure 4: Procurement Digital Framework (PDK), depicted with six dimensions of PCCM

Digital technology will help procurement increase communication, collaboration, analytic reports, and engagement using a spectrum of tools along P2P process from planning and sourcing to contract negotiations, order delivery, payment, and supplier management. Digitalization will support procurement organization and its capabilities to the new opportunities for globalization and new challenges to speed up communications and close up the network. In addition, layout an IT architecture strategy and e-Procurement platform will specify procurement processes, organization structure and a road map for procurement function.

6. Discussion and Conclusions

In this study we applied the six dimensions of procurement maturity (Batenburg, 2008), strategy, processes, control, organization, information and e-Technology and defined twenty two determinants of procurement capability maturity. This model is called "Procurement Competitive Capability Maturity" (PCCM).

The PCCM enables procurement functions to visualize their capability maturity stage and be able to point out the missing capabilities in order to reach the higher level of capability maturity and balance them in its organization. This study selected fifty two procurement organizations in Southeast Asia as the target group. The approach of the study is applicable only in four business categories; manufacturing, consumer products, retails, and others. More industries and case studies should help in determining of the validity of PCCM.

From the study we found that procurement capability maturity has no relation to the industry, but it is dependent on the size of procurement spend and centralization/ decentralization structure in the procurement function. The larger spend and centralized procurement has a positive relation to the capability maturity. In addition, the need to encourage companies which have an opportunity on a larger-scale and optional for procurement structure to extend vision of the capability maturity and leverage it in order to gain the benefit in the complex and dynamic environment in this region.

With e-Procurement solutions, internet technology makes the purchasing activities more efficient and cost effective for a business to reduce the transaction costs, making better decisions, minimizing order cycles, improved relationship with suppliers and increase their value of customer service. A good e-Procurement system will support the interaction of suppliers in a network globally not an individually. This will lead to the sustainability for collaboration and relationships with a supplier in the supply chain. PCCM will help management to assess and benchmark procurement functions across the company for balanced capability maturity in order to improve value in the organization. In addition, if procurement standardizes the ordering process it will increase compliance which reduces the confusion and misinterpretation.

Based on the results of this study, it has been realized that there are many opportunities for procurement functions to drive additional value into their organizations and enhance value in the procurement model with the proper technology implementation. Moving to the digital strategy companies must be able to identify and evaluate its own capabilities in order to build a solid foundation.

Procurement should become a strategic know-how about suppliers and an expertise about the goods and services that are procured and gain the value from today's competitive market. Capable procurement organizations can provide the value not only for the internal, but also external to suppliers and customers. People, organization and systems will increasingly connect to a network through the digital technology to benefit the entire group.

Moreover, the positive significance of the capability maturity is strategic leaders who have a lower cost of growth, greater business flexibility, increased market certainty and a significant competitive advantage. The importance of CPO collaboration and the Supply Chain

Director is to articulate the tangible benefits of embedding procurement into the business planning and direction making processes, and bringing spend under contract, auditing and monitoring progress, reducing costs and making better use of systems and technology.

The challenge for the further study is how to influence the business to improve the existing process and transform their organization to the desired maturity stage. Future research should aim at a larger number of the organizations and extend the study group in diverse industries. And it is possible to apply Kraljic's Portfolio matrix by the product categories and procurement segmentation to capability maturity with respective of IT technology. The centralization and decentralization procurement organizations have been an on-going discussion for several decades to understand and manage it. The future study may extend the model to indicate the applicable of e-Procurement in this area.

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