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DETERMINING THE CHARACTERISTICS OF E-SCM FOR SMALL AND MEDIUM ENTERPRISE IN SCREEN PRINTING IN INDONESIA USING SUPPLY CHAIN OPERATION REFERENCE AND QUALITY FUNCTION DEPLOYMENT

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Abstract

ASEAN Economic Community has just began which make any businesses need to prepare for the increasingly fierce competition. Technology is needed to support the organization in achieving competitive advantage, including for small and medium enterprises (SMEs) in the screen printing sector in Indonesia. Technology can support a variety of activities or processes within the organization, including in the area of supply chain. E-SCM is one of the technology that can support SMEs in managing the supply chain better. In this study, we design the e-SCM system based on mapping from Supply Chain Operations Reference (SCOR) approach. The features is developed using Quality Function Deployment (QFD). 21 attributes of customer requirements (or wants) are developed from the theory of SCOR, where the weight of each attribute is produced through a survey to 166 respondents SMEs in screen printing business in three cities, Bandung, Jogjakarta and Bali. From the data processing using QFD, we proposed the top 5 characteristics/ features of e-SCM for SMEs in screen printing in Indonesia, namely: 1) Product Order; 2) Production Time; 3) Production Cost; 4) Material Order; 5) Payment Order.

Keywords: E-SCM, Supply Chain Operation Reference, Quality Function Deployment, SMEs

INTRODUCTION

In winning the competition, especially in facing the ASEAN Economic Community (AEC), every company need to understand their positioning toward the industry, local or in ASEAN region, including the Small and Medium Enterprises (SMEs). The small business sector of micro and medium enterprises (SMEs) play a significant role in sustaining local economic activity; SMEs with all of their characteristics are able to provide a large selection of economic activity is much needed by producers, consumers and governments (Mukhlis and Sumanjuntak, 2016). Technology adoption, including ICT services will become a must if SMEs want to increase their competitive advantage. The adoption and usage of the ICT services including e-commerce and other electronic applications (such as e-SCM) is heavily dependent on availability of communication infrastructure, adequate ICTS facilities, availability of financial resources, network connectivity, bandwidth and the general awareness by the general populace (Chivasa & Hurasha, 2016). In this case, supply chain management is also become one of the important factor that the SMEs need to adopt. Chivasa & Hurasha stated that the success of e-commerce depends on technologies like electronic funds transfers, supply chain management, internet marketing, online transaction processing, electronic data interchange, inventory management systems and automated data collection systems (Chivasa & Hurasha, 2016).

In order to manage their supply chain, the SMEs need to identify their flow of activities (including material and information). Despite, to manage their supply chain, Supply Chain Operation Reference (SCOR) can be used to measure their reliability, responsiveness, flexibility, costs, and their assets. The business process flow can be mapped using SCOR variables: PLAN, SOURCE, MAKE, DELIVER, and RETURN.

SCOR model is chosen because Supply Chain Council recommend that SCOR framework links performance metrics, processes, best practices, and people into a unified structure. The framework supports communication between supply chain partners and enhances the effectiveness of supply chain management, technology, and related supply chain improvement activities (Supply Chain Council, 2006).

This research involved respondents from 67 screen printing's SME from three main city in Indonesia, such Bandung, Jogjakarta, and Bali. Mixed methods is used for this research. Qualitative approach is used in mapping supply chain business flow using SCOR variables, plan, source, make, deliver, and return for those cities. The SCOR model map is general for those cities since the detail process of plan, source, make, deliver, and return is slightly different. And from SCOR model, we can create the indicators for identifying customer voice and the priority of each through questionnaires.

The indicators can be used as source of customer requirements (customer voice) in Quality Function Deployment. Then we identify technical requirements that answer the customer voice, and create scores for related items. By using QFD we can identify the main technical requirements that is needed for developing e-SCM for screen printing SMEs.

LITERATURE REVIEW

SCM

Supply chain is about flow of material and information from suppliers to customers. Christopher define Supply Chain Management as the management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole (Christopher, 2011). It is important to manage both streams, customers and suppliers, in running business smoothly.

SCOR

Supply Chain Operations Reference was introduced in 1996 by Peter Bolstorff. (Bolstorff, 2012). SCOR is a single framework that combines elements of business process engineering, metrics, benchmarking, leading practices, and people skills. Under SCOR, supply chain management is defined as these integrated processes: PLAN, SOURCE, MAKE, DELIVER, and RETURN— from the suppliers' supplier to the customers' customer, and all aligned with a company's operational strategy, material, work, and information flows (Bolstorff, 2012). Using SCOR approach, the organization including the screen-printing SME's can identify the performance gap and their lost opportunities in order to increase their performance (Irawan, et.al. 2015).

e-SCM

The objective of e-SCM is to incorporate the activities across and within organizations in order to provide customer value. Such integrated supply chain involves coordination and information sharing up and down the process among all stakeholders which is the cornerstone for exploiting the ultimate benefits of integrated supply chain leading to opportunities for competitive advantages (Ivanovska and Kaleshovska, 2013). The new technology enable digital connection in the e-SCM that can impact on the performance of the supply chain in that it enables e-commerce, information sharing and knowledge sharing. By adopting e-SCM, the organizations can get benefits such: information visibility and sharing, real time communication, order tracking, better real-time forecasting decision, faster delivery, improved partner relationships,

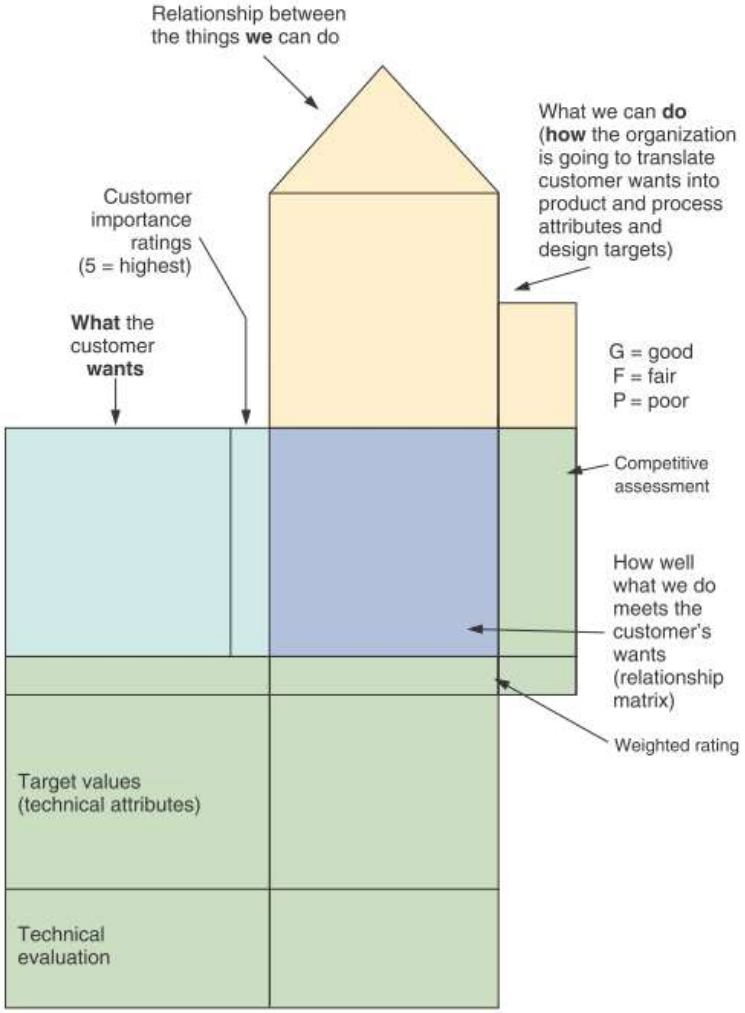
understanding of customer needs, increased customer satisfaction, faster market adaptation, reduced resources, cost savings, and increased profits (Ivanovska and Kaleshovska, 2013).

Quality Function Deployment

Quality Function Deployment define as a process for determining customer requirements (customer "wants") and translating them into the attributes (the "hows") that each functional area can understand and act on (Heizer et.al., 2017). In order to define those "wants" and "hows" more easily, Heizer proposed House of Quality (HoQ) as a tool for drawing the correlation using matrix. Heizer stated that HoQ was part of the QFD process that utilizes a planning matrix to relate customer "wants" to "how" the firm is going to meet those "wants" (Heizer et.al, 2017).

Traditional quality function deployment (QFD) is a structured methodology that uses four matrices to translate customer requirements into specific quality design and manufacturing requirements for total customer satisfaction (Ermer and Kniper, 1998). The House of Quality (Quality Function Deployment) model can be seen as follow:

Figure1 Quality Function Deployment (House of Quality) Model (Heizer et.al, 2017)



RESEARCH METHODOLOGY

In this research, the population are SME's leaders at screen printing industry in three major city, Bandung, Jogjakarta, and Bali. Sample are defined for each city using Slovin methods.

Sampling technique used is non probability sampling. In non-probability sampling designs, the elements in the population do not have any probabilities attached to their being chosen as sample subjects (Sekaran and Bougie, 2016).

Primary data collection methods can be used for study as interviews, observation, questionnaires, physical measurement, and unobtrusive (Sekaran and Bougie, 2016). For this research, we use interviews for revealing the technical requirements to answer customer wants. Questionnaire is used to measure the respondents' perspective toward customer requirements for Quality Function Deployment. Secondary data collection was conducted by searching relevant data / information from books, journals, previous research, and online literatures.

ANALYSIS AND DISCUSSION OF RESULTS

From the previous research were known that every SME in screen printing industry in the three city mostly have the same process activity and only little differences some part (Tricahyono, et.al, 2015). Based on that process flow, the researchers design the process mapping using SCOR approach in order to define the activities that connect their suppliers, the company, and their customers. The general process mapping for SME's screen printing in three city using SCOR can be defined as follow.

Figure 2 Process Mapping using SCOR for SME in Bandung, Jogja, and Bali

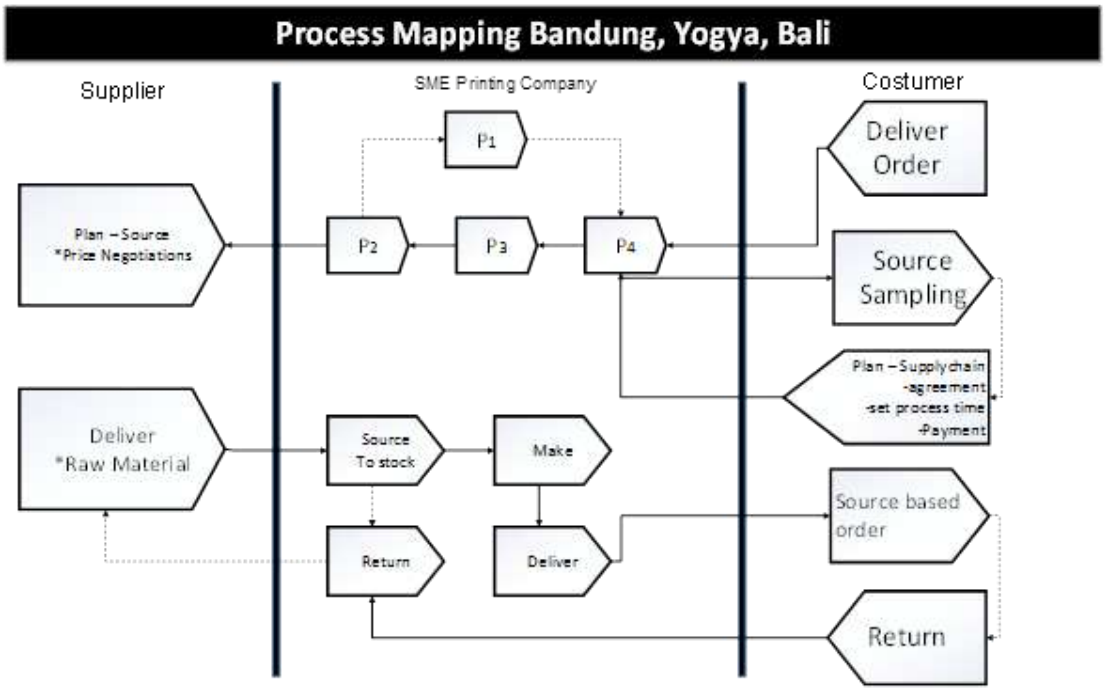


Figure 2 show current supply chain process mapping for three industries in Bandung, Jogjakarta, and Bali. In that mapping, only three actors are involved, suppliers, the companies, and their customers. It is because the majority of SME's company in this industry have direct interaction with their customers using forward buying with customer pick up the distribution system.

In supplier side of supply chain, the interaction between the company and their suppliers limited to price negotiation, as seen in Plan-Source indicator, which is planning related with raw material sources and deliveries. Some of the suppliers accept the return of raw material if damaged.

Planning is the main process in SMEs supply chain, since it related with material order, production process based on customers order, and sampling plan. The next internal process inside the company is production process (Make), storage of products (Source to stock), receive products return and send materials return to suppliers, and products deliveries.

In customer side, the customers involved in deciding materials used, and planning the process time, payment method, and completion time.

From the survey revealed that all respondents are using smartphone with android technology. This valuable information will considered for e-SCM development based on android system. Also the respondents were provided by some open questions to collect some of their expectation from the system.

Most of the respondents expected to use the system easily (user friendly), and connect to the internet so they can communicate with their suppliers and customers and do the marketing effort as well.

From the questionnaire, we can have the respondents' expectation from e-SCM system and then translate into Customers Requirement with the weight calculated from the respondents' perception for each attribute (see Table 1 for column 1, 2, and 3).

Table 1. Quality Function Deployment for e-SCM system

SCOR Dimension	CUSTOMER REQUIREMENTS	TECHNICAL REQUIREMENT								
		% weight	Supplier Profile	Material Order	Production Cost	Production Time	Production Quality	Product Order	Product Delivery	Product Payment
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Plan Source	Price negotiation with supplier	78.67%		◯						
	Supplier Search for price and quality	82.41%	◯							
P1	Price calculation (for all production process)	83.98%			🅾					
	Production time calculation (from supplier, production, until customer)	84.58%		•		🅾		◯		
P2	Material planning (by material types)	83.86%		🅾	🅾			◯		
P3	Workers and machinary operation time (by order size)	82.17%				🅾				
P4	Order receipt information	83.98%						🅾		
Plan-Customer	Customer payment channel	84.22%			🅾					🅾
	Appointment with customers	91.93%						◯		
	Production time information for customer	84.34%				◯		•	•	
Make	Information about production time (measurement, cutting, sewing, design, filming/framing, exposing, fabrics printing, drying, steam, quality control, packing)	86.27%				🅾				
Source to stock	Information about number of material received from supplier	85.18%		◯						
Source based order	Material calculation to fulfill customer order	84.58%		◯				◯		
Source sampling	Material sample information for customer order	83.61%						◯		
Deliver raw material	Material delivery process	84.22%		•						
Deliver product	Product delivery process	84.70%							🅾	◯
Deliver order	Customer order information	85.30%						🅾		
Return	Product return information	83.37%					•		•	•
	No of product defect	87.95%					🅾			
Make	Process tracing for defective product	84.22%					🅾			
	Information of burden that should paid by company or customer	85.78%			•					🅾
	Weighted Rating		2.472	13.33	13.46	15.18	9.442	22.16	5.912	11.87
	Rank:			4	3	2		1		5

• Low relationship
◯ Medium relationship
🅾 High relationship

After defining the customer requirements, we did discussion with the expert for identifying the technical requirement needed for e-SCM system. We came up with eight element that can answer or fulfill customer requirements. After that, we analyze the relationship between customer requirements and technical requirements, using three scales: low (●) with score 1, medium (◯) with score 3, and high relationship (❶) with score 5 (see Table 1 column 4 – 11). Then we calculate importance rating for each technical requirements, come from total of multiplication of each customer requirement weight and relationship score.

For Material Order, as an example, the importance rating can be calculated as follow: (78.67%x3)+(84.58%x1)+(83.86%x5)+(85.18%x3)+(84.58%x3)+(84.22x1) = 13.33

After calculate all the importance rating, we find the top five of technical requirement as follows: (1) Product Order; (2) Production Time; (3) Production Cost; (4) Material Order; (5) Payment Order.

Therefore, the design of e-SCM system need to consider this top five technical requirements to be realized in the system.

CONCLUSION

From this study, we can conclude that Quality Function Deployment can be used for developing certain characteristics for e-SCM system design. The twenty one of customer requirements attributes for QFD can be derived from SCOR model, through mapping the process specifically for SME's screen printing in three major city in Indonesia (Bandung, Jogjakarta, and Bali). Eight of technical requirement was developed to answer the need of customers. Using importance rating calculation, we came up with top five of technical requirements that become mandatory for designing e-SCM for SME's screen printing in Indonesia, as follow: (1) Product Order; (2) Production Time; (3) Production Cost; (4) Material Order; (5) Payment Order. For further research, there is opportunity to used different approach in identifying customer voice other than using SCOR model. Also there is possibility to continue the research using House of Quality Sequence to translate technical requirements into specific components needed to fulfill those technical requirements.

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