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Minimizing Inventory Cost through Sustainable Supply Chain Practices: Experience from Malaysian SME Companies

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ABSTRACT

In this study, a concrete focus is highlighted on the SME manufacturers in Malaysia in the process of minimizing inventory cost management. The SMEs in Malaysia are unable to have digital inventory system like multinational companies (MNCs) because of their financial constraints. Thus, it is timely to study how the SMEs can make the order quantity on time to meet the demand for production and simultaneously to minimize the inventory costs with the available resources. The factors influencing the inventory cost were identified from the literature and are just in time, vendor managed inventory in their purchasing activity, electronic data interchange system, supplier engagement, supplier's quality and supplier infrastructure with the buyer-supplier relationship as the mediating variable towards minimizing the inventory costs. The management theories used in this research are transaction cost theory and resource based view theory, which supports the conceptual framework. The findings of the study reveal that just in time, supplier infrastructure and electronic data interchange system_2 were positively influencing in minimizing inventory costs. Besides this, buyer supplier relationship has significant and positive effect on minimizing inventory costs and it acts as a pure mediator. The implications of the current research contribute in helping SME companies to minimize the inventory costs and this will facilitate a better financial performances.

Keywords: Inventory cost, just in time, vendor managed inventory, electronic data interchange system, supply engagement, supply quality, supply infrastructure

1. INTRODUCTION

Inventory is the stock up materials that use to fulfil customer needs, but with the excess of the inventory would incur cost. The inventory costs are included stock out cost, ordering cost, holding cost and purchase cost (Hira et al., 2009). Crucial decision needed to take place by inventory manager on the carrying cost and ordering cost (Samak & Rajhans, 2013). Ordering cost usually reduce when organization order in large volume of quantity. On the other side, ordering with the high quantity would cause high maintaining cost which sometimes amount to larger than the ordering cost. Therefore, purchase quantity would affect the firm's financial performance. Based on Lwiki, Mugenda, and Wachira, (2013) concluded that finance performance is direct positive influence on the inventory cost that included due to maintaining cost, holding cost, ordering cost as well as stock out cost. Thus, it might affect the financial performance for SMEs when the inventory cost is very high.

SMEs were been recognised with different environment when compared with the large companies (MNC). Mostly, SMEs have more concerns on their profits than inventory management. With the insufficient capital investment and financial support, most of the SMEs implement manual system for inventory record instead of implementing customisation of the inventory system. SMEs were using manual inventory system due to the volume of production is low as well as most of the SMEs lack of availability and knowledge of the efficient technology especially customization information system such as enterprise resource planning (ERP). Based on Rajeev (2008) mentioned that SMEs have lack of knowledge and no right technical input for minimizing inventory cost. However, by using the manual inventory record may cause high probability of having inaccuracy inventory level whereby it is different with the physical quantity. Based on the research in USA, 65 percent of the 3 million inventory records were incorrect and inventory inaccuracy was caused by the physical inventory and the system recorded quantity is not tallying, often happens in SMEs (Theil, Hovelaque & Vo, 2010). Therefore SMEs have to implement right method and establish good relationship between the supplier and buyer for minimizing the burdensome inventory cost.

2. LITERATURE REVIEW

Stock is an items or resources that used in organization, which called as inventory (Samak, Kulkarni & Rajahans, 2013). Stock of the item could base on the customer's forecast demand, ordering size as well as the lead-time of the material. The inventory costs are included stock out cost, ordering cost, holding cost and purchase cost (Hira and Gupta, 2009). In order to have sufficient stock level for the organization's production is operating smoothly and sufficient goods to supply their customer, it incur of inventory cost. Optimizing inventory cost through Wagner-within algorithm able to determine the minimizing ordering quantity as well as calculated total annual inventory cost reduction (Samak, Kulkarni & Rajahans, 2013), layout design to minimize the damage and carry cost (Krittanathip, Cha-um, Suwandee, Rakkarn and Ratanamaneichat, 2013) and ordering size could determine the reduction of lead time (Chang, Ouyong, Wu, and Ho, 2006).

Besides that, just in time is a program mainly used to reduce waste in the organization. Organization will benefit with the cost leadership business by having the JIT benefits and components efficiency for the firm that utilized mixed, customized and differentiated business strategy as well as implementing JIT, modifying procedures, operation and workforce with top manager involvement (Yasin, Small and Wafa, 1997; Hernandez, 1989; Schniederjans and Cao, 2000). By using the cased-based approach, Nurul Hayati, Noriah

and Roseleena (2015), concluded applied JIT in assembly production line could reduce the enormous cost as well as reduce the inventory. Vendor managed inventory (VMI) involves the supplier making replenishment decision for raw material that supplied to their customer based on various stock and supply chain policies. Implementation of VMI proven that helps in inventory reduction not only for the customers but for also suppliers. The result from Waller (1999), indicate the higher utilization manufacturing capacity and high review of inventories more frequently as well as short delivery interval could help in greater the inventory reduction result from the simulation study in two-stage supplier chain analyzed demand variability, limited manufacturing inventory and parties involvement with implemented VMI. Recently, Hong, Wang, Lei and Ali (2016), demonstrated vendor managed inventory total system inventory cost is lower than traditional system cost by using vendor's setup cost and inventory holding cost as the key parameter.

Inter-organization system among the supply chain such as electronic data interchange system able improved in term of operation wise as well as strategic advantage to implementing company (Qi and Yu, 2010). Son, Riggins and Narasimhan, (2005) has developed a powerful theory as well as explore effect of the relationship and cooperation from supplier increase EDI diversity. Implementation for the EDI could benefit the organization such as increase the efficiency of the business process. In the research of Ernst and Kamrad (1996) showed about the information of inventory level and time to replenishment could transmitted efficiently from the warehouse towards supplier by using the EDI. In Ngai and Gunasekaran (2004) mentioned, about the critical success factors included the strategic of agreements and forecasting for IT as well as support from top management and employees IT skill for adoption of benefit of EDI to improved organizational competitiveness. Based on Angeles and Nath (2000), great impact on buyer's profit possible from production will increase great impact on the buyer's profitability and great open communication among the partner flexibility. Todeva and Knoke (2005), cited that many information and capability with minimum cost idleness with develop network among the supply chain by having active engagement activities.

In previously decades, supply chain management, most of the companies is not willing to engage their supplier in their organization process due to risk of knowledge protection. Obstacles of innovative generation in supply chain cost of coordination increase and high business risk from the international exchange relationship (Jean, Sinkovics and Hiebaum, 2014; Mirza Abdullah et al., 2015). Eisenhardt and Tabrizi (1995) stated, in order to achieve the benefit from the supplier involvement, there are many management challenges associated. Therefore, nowadays most of the organization is realizing on the important sustainability of their supplier, thus they started try to manage the risk and involve supplier in some of the process. Besides that, engaging of supplier in the strategic alliances could encourage the organization to increase the innovative of implementing the various strategic to achieve the organization goals. There are many benefits of creation synergies to organization and resources acquisition from supplier from the active engagement activities (Todeva and Knoke, 2005).

Other than that, supplier infrastructure is important for the manufacturer as a consideration during supplier selection. This is because of the supplier capability to increase the flexibility of supply. Supplier infrastructure included, technical skill and capability stock of resources (Hyland, Soosay, and Sloan 2003), volume flexibility and mix flexibility with their manufacturing system that meet buyer needs such as product requirement and demand. (Squire et al., 2009; Holweg, 2005). Supplier's technology capability is important

to be evaluated due to it could help the buyer set up the similar information system that could increase efficiency of information sharing. Liker, Kamath and Wasti (1998) study mentioned about the supplier's technology capabilities is an element to be considered during supplier selection and rewarded technically innovative supplier that could responsibility given for the product development. In recently study by Pazhani, Ventura and Mendoza (2016), mentioned about the selection of the.

Other than that, Lai et al. (2005) concluded their study about supplier commitment to quality could increased by encouragement from buyer of the firm who need to build stable relationship with the suppliers as well as identify the contingency of the certainty of supply chain. Thus, quality is important for buyer supplier relationship as well as with close relationship is based on trust and cooperation, mutual sharing risk and benefit between buyer is an important implication (Srinivasan et al., 2011). Based on Lida (2012), the effort of increasing the benefit of cooperative cost saving and latter compensates the all parties cost is from their efforts of sharing. Thus in this research is conducted to examine the relationship between just in time and vendor managed inventory, supplier engagement, supply infrastructure and supply quality as the independent variables to minimizing inventory cost and examine the mediating relationship of buyer supplier relationship between all the independent variables and minimizing inventory cost. The conceptual framework this research is depicting in Figure 7.1.

2.1. The relationship between JIT and VMI towards minimizing inventory cost

Just in time (JIT) and vendor-managed inventory (VMI) is another purchasing strategy where the vendor will be parties whom in-charge to help manufacturers to plan the inventory and ensure the stock ability to support production. Based on Kaipia, and Transken, (2002) mentioned about vendor will be the responsible person to help on the ideal replenishment schedule for manufacturer stock level and furthermore buyer's maximum and minimum level could help the supplier to decide the optimum restock schedule. Consequently, it could causes manufacturer able to minimizing their inventory cost with implementation the right purchase strategy. Hence this study proposed:

H1*a*: JIT and VMI have positive relationship on minimizing manufacturer's inventory cost

H1*b*: JIT and VMI have positive relationship on buyer supplier relationship

2.2. The relationship effect electronic data interchanges system on minimizing inventory cost

Du, et al., (2011) mentioned about inter-organization system was an IT based system that offering cooperation, coordination and connectivity between all parties in supply chain. Angeles and Nath (2000), shorted window time for information exchange among the firm through the digital nervous system such as EDI. This could increase the efficiency of information sharing which could affect the minimizing inventory cost. Willingness of sharing information could be more effectively through good buyer supplier relationship. Buyer-supplier relationship exist could strengthen the use of EDI (Vijayasarathy and Robey, 1997). Hence, this study proposed:

H2*a*: Implementation of EDI has positive relationship on minimizing manufacturer's inventory cost

H2*b*: Implementation of EDI has positive relationship on buyer-supplier relationship

2.3. The relationship effect of supply engagement on minimizing inventory cost

Communication could be important element in helping to build the good buyer-supplier relationship and increase the quality of relationship between the buyer and supplier through information sharing. Information management could lead the buyer-supplier relationship get stronger and closer as well as higher quality supplier relationships (Rajagopal, 2009). Other than that, supplier engagement could help in minimizing the inventory cost due to the supplier willing to share their knowledge as well as their expertise in term inventory management as well as the expertise on product development. Chang, & Park, (2010) stated that, buyer and supplier usually needed a win- win situation and sharing information is the way that manufacturer and supplier share their profit as well as values. Thus, the firm needed to increase the effort of engaging with supplier that could positively and directly influence their relationship. Specifically this study proposed:

H3*a*: Supplier engagement has positive relationship on minimizing manufacturer's inventory cost

H3*b*: Supplier engagement has positive relationship on buyer-supplier relationship

2.4. The relationship effect of supply infrastructure on minimizing the inventory cost

Besides that, supplier's technology capability could related to the capability of supplier in term of design capabilities as well as the engineering capabilities in order to help to buyer to determine the issue. Weigelt, (2013) stated that, designing the IT platform and problem solution in term of delivery services is a supplier's competence. Therefore will better IT platform as well as integrated platform could help to better in information sharing and improve the buyer supplier relationship in order to increase the performance for inventory control among the SME manufacturers. Besides that, flexibility in supply chain can be defined as ability to change in order to meet the customer needs and wants. Holweg, (2005), founded that, flexibility system could replace with responsiveness in the manufacturing system. Therefore with the increase of responsiveness of supplier could increase the performance of reduction of inventory. Hence the following hypothesis is developed:

H4*a*: Supplier infrastructure has positive relationship on minimizing manufacturer's inventory cost

H4*b*: Supplier infrastructure has positive relationship on buyer-supplier relationship

2.5. The relationship effect of supply quality on minimizing the inventory cost

Quality is an element that increases the stability of the supply chain relationship. Buyer-supplier relationship could establish through quality in supply chain and supplier require to work beyond the organization's boundaries that could help in improving the performance (Keng Lin Soh et al., 2016; Lai, Cheng & Yeung, 2004). Collection of achieving the performances improvement activities are know as continuous improvement. Manufacturers who implementing continuous improvement for reduces waste as well as increase performance with better quality. Therefore continuous improvement is important in supply chain. Supplier need to more proactive making to improve their performance through expanding their differentiated product, knowledge and services (Fink, Edelman, & Hatten, 2007). Consideration on the mutual benefit and cost could be evaluation towards the parties in supply chain for the relationship stability. Thus, the following hypothesis is developed:

H5*a*: Supplier quality has positive relationship on minimizing manufacturer's inventory cost

H5*b*: Supplier quality has positive relationship on buyer-supplier relationship

2.6. The relationship effect of buyer supplier relationship on minimizing inventory cost as well as mediating the independent variables (IV)

Importance of information sharing in term of knowledge from the supplier towards manufacturer is a kind of benefit information sharing between the supplier and buyers. Rashed, Azeem and Halim (2010) mentioned about positive relationship between the sharing knowledge and the performance whereby the buyer suggested being distribution on the new knowledge and advancement from acquisition, adaptation and acquisition as well as vice versa from supplier. According to Kawai, Sakaguchi, and Shimizu, (2013) suggested that, buyer who willing to extend the buyer supplier relationship through long term relationship from information sharing practice, especially inventory and cost information. Hence through the great trust, commitment as well as communication could help to manufacturer to minimize the inventory cost as well as joint supplier activities, investment and engagement and communication from the buyer supplier relationship help the organization increase competitive advantage Prior (2012). Therefore, the buyer supplier relationship could be mediator for the independent variables toward to achieve the cost reduction in term of inventory and argued as per below:

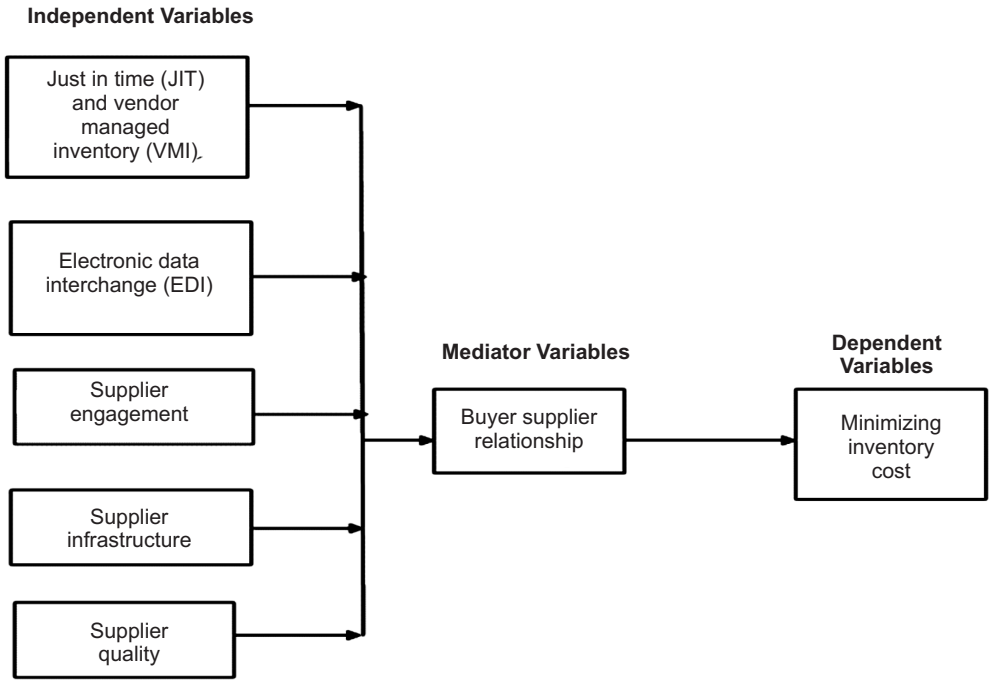

Figure 7.1: Conceptual Research Framework

H6: Buyer-supplier relationship has positive relationship on minimizing manufacturer's inventory cost

H6*a*: Buyer-supplier relationship mediates the influence of JIT and VMI on minimizing manufacturer's inventory cost

H6*b*: Buyer-supplier relationship mediates the influence of implementation EDI on minimizing manufacturer's inventory cost

H6*c*: Buyer-supplier relationship mediates the influence of supplier engagement on minimizing manufacturer's inventory cost

H6*d*: Buyer-supplier relationship mediates the influence of supplier infrastructure on minimizing manufacturer's inventory cost

H6*e*: Buyer-supplier relationship mediates the influence of supplier quality on minimizing manufacturer's inventory cost

3. RESEARCH METHODOLOGY

Table 7.1
Demographic Profile of Respondents

Demographic profile	*Description*	*Frequency*	*Percentage*
A1. Gender	Male	36	55.38%
	Female	29	44.62%
A2. Ethnicity	Malay	6	9.23%
	Chinese	52	80.00%
	Indian	7	10.77%
A3. Educational level	SPM/ STPM	2	3.08%
	Diploma/ certificate	15	23.08%
	Degree bachelor	36	55.38%
	Master/ Postgraduate	12	18.46%
A4. Age completed years	Less than 20 years	2	3.08%
	21-30	52	80.00%
	31-40	11	16.92%
A5. Job description	Buyer/ purchaser	20	30.77%
	Inventory officer	25	38.46%
	Manager	7	10.77%
	Other	13	20.00%
A6. Scale of the SME company	Small scale company	30	46.15%
	Medium scale company	35	53.85%

The unit of analysis for this study and the respondents are managers, purchasers, and inventory officers who are working in small and medium scale (SME) manufacturing in Malaysia that have the knowledge and experience about organization's inventory status and supply chain status in their company. Generally based on Black (1998) suggested, ten respondents to one variable is more acceptable. Therefore based on the framework above has showed six variables included the independent variables, and mediator variables thus the minimum sample size is determined to be sixty respondents for this study. The population for this study are involved personnel that working in procurement department such as sourcing and purchasing departments of small and medium scale manufacturing in Malaysia, thus in this study is the non-probability judgmental sampling method. By using this sampling method is because of the advantages such as time reduction and minimum cost and judgment sampling method is used when the number of individuals posses

in the sample of interest is limited and is a technique to achieve the information from the specify group. The study utilized convenience sampling, where the questionnaires will distributed through their human resource officer of that organization to all the related respondents in procurement department and collect back instantly after completion. Besides that, this research has used email to distribute the questionnaire to SME companies in Malaysia.. The total questionnaires that distributed to SME manufacturer companies in Malaysia are around 1600 sets through email and distributed to the individual. The overall of questionnaire return was around 107 sets that are about 6.7 percent response rates from the manufacturer. From the total questionnaires collected, there are 42 sets of respondents are unusable due to those respondents are having the customization of inventory system in their company and the organization do not implement electronic data interchange system. Therefore, the total questionnaire that could use for this study is only 65 sets. The summary of the data collected demonstrated in under table1. The collected data need to be process and analyzed by using the Statistical Package for Social Sciences (SPSS) software. By using the software, the collected date able to generate standard deviation, mean, descriptive analysis factor analysis, reliability analysis, correlation matrix and multiple regression for data goodness as well as hypotheses testing.

4. RESULTS AND DISCUSSION

Table 7.2
Factor Loadings Table

Construct	*Items*	*Factors*							
		F1	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	*F8*
Just in time and vendor managed inventory	JV1	0.897							
	JV2	0.883							
	JV3	0.793							
	JV5	0.399							
Electronic data interchange system_1	ED1		0.938						
	ED2		0.926						
Electronic data interchange system_2	ED5			0.917					
	ED6			0.898					
Supplier engagement	SE1				0.856				
	SE2				0.833				
	SE3				0.815				
	SE4				0.796				
	SE5				0.638				
Supplier Infrastructure	SI1					0.884			
	SI2					0.875			
	SI3					0.857			
	SI4					0.819			

Construct	*Items*	*Factors*							
		F1	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	*F8*
Supplier Quality	SQ1						0.815		
	SQ2						0.808		
	SQ3						0.767		
	SQ4						0.717		
Buyer-supplier relationship	BR1							0.91	
	BR2							0.907	
	BR3							0.859	
	BR4							0.828	
	BR5							0.82	
	BR6							0.811	
Minimizing inventory cost	IC1								0.911
	IC2								0.905
	IC3								0.884
	IC4								0.863
	IC5								0.857
KMO		0.657		0.584	0.644	0.759	0.644	0.856	0.853
Bartlett's Test of Sphericity		99.672 (p<0.001)		111.188 (p<0.001)	158.004 (p<0.001)	145.182 (p<0.001)	88.1 (p<0.001)	302.309 (p<0.001)	262.202 (p<0.001)
Total Variance Explained		59.322	44.8	42.564	62.634	73.865	60.536	73.412	78.156
Cronbach's Alpha		0.757	0.884	0.823	0.849	0.88	0.781	0.927	0.93

Usually we are using the factor analysis and reliability analyses were used to measure on the goodness of the data. This research is using convergent factor analysis and the first of independent variable is JIT and VMI implementation. The KMO for this variable is 0.657 with 1% of Barlett's of Sphericity. There are 2 questions (JV4 and JV6) need to drop and balance 4 questions (JV1, JV2, JV3 and JV5) under this variable. After dropped 2 questions from JV variables, the Cronbach's Alpha was 0.757 which is more than the expected value of 0.5 and it is acceptable.

Electronic data interchange system (ED), were split into 2 factors, electronic data interchange system_1 consist of items of ED1 and ED2 as well as electronic data interchange system_2 consist of items ED5 and ED6 and The Kaiser-Meyer-Olkin is 0.584 as well as the The Barlett's test of Sphericity is also significant with the probability at 0.000 (p<0.001). Besides that, both variables (electronic data interchange system_1 and electronic data interchange system _2) were reliable due the Cronbach's Alpha is more than 0.5 such as 0.884 and 0.823. Other than that, the KMO for supply engagement variable was 0.664, 0.759 for supplier quality variable and supplier infrastructure variable was having 0.759 as well as all the variables are 0.5 which indicating that there is sufficient anti-image correlation between the items. All the anti-image correlation is more than 0.5 for all the variables, which showed that all the items correlated. Besides that, all variables for

SE, SI and SQ are demonstrate highly Cronbach's alpha which all the items are highly consistent among the items within the factor such as 0.849, 0.880 and 0.781. Last but not least, KMO for buyer supplier relationship is 0.856, Cronbach's Alpha is 0.927 and dependent variable, minimizing inventory has KMO is showed 0.853 and Cronbach's Alpha is 0.930 which greater than the minimum value 0.5.

Table 7.3 presents descriptive statistic for the independent variables (JV, ED, SE, SI and SQ), mediating variable (BR) and dependent variable (IC). Independent variable was measured with on a five scale Likert scale. The scale ranged from 1 being strongly disagree to 5 being strongly agree. On the five scales Likert scale, mean below the 3.0 will consider as low and the average is 3.0 and above 3.0 is high. Dependent variable and mediating variable were using seven Likert scale. The seven scale ranges from 1 being strongly disagree to 7 being strongly agree and 4 as the neutral. There based on the result in table 4.5.1, all the variables were showing mean is high, which mean for all variables are more than 3.0. Besides that, from the table the standard deviation were uniform without extreme value supporting the validity for further analysis. From the description analysis results, the top variable that minimizing inventory cost was buyer supplier relationship, 5.8 and follow up with the minimizing inventory cost which is 5.0631 and highest standard deviation which is 1.07616. The value is high due to there are some of SME manufacturers do not focus or concern on their inventory level and causing the variation is high.

Table 7.3
Descriptive Statistics

Variables	*Mean*	*Std. Deviation*
Just in time and vendor managed inventory	3.5577	0.68859
Supplier engagement	4.2431	0.62699
Supplier infrastructure	4.1654	0.67644
Supplier quality	4.1154	0.59140
Electronic data interchange system_1	3.6077	0.79791
Electronic data interchange system_2	4.2846	0.76531
Buyer supplier relationship	5.8000	0.96114
Minimizing inventory cost	5.6031	1.07616

The first model to be tested is the direct effect between independent variables toward dependent variable. The result was demonstrated in table 7.2, whereby the R square value are 0.564 and the F value is 12.483 as well as the Durbin Watson value is 1.777. The VIF value for all the variables is less than 10 which ensure there is no multicollinearity problem in this model. Based on the significant value, just in time and vendor managed inventory, supplier infrastructure as well as electronic data interchange system_2 are significantly toward minimizing inventory cost. Then tested for model 2 which using the hierarchical regression analysis with addition mediating variable (buyer supplier relationship) into the relationship between independent variables and dependent variable. After adding buyer supplier relationship as the mediating, the R square changes from 0.564 to 0.708 with increases 0.144. The variables such as just in time

and vendor managed inventories as well as electronic data interchange system_2 significant to minimizing the inventory cost. Supplier engagement becomes insignificant after adding the mediating variable. The VIF value for all the variables is less than 10, which ensure there is no multicollinearity problem in this model. The result demonstrated in table 7.5.

Table 7.4
Model 1 Regression Analysis for Independent Variables to Dependent Variables

Model	*Standardized Coefficients Beta*	*t-value*	*p-value*	*Collinearity Statistics (VIF)*
AVEJV	0.302	3.153	0.003	1.216
AVESE	0.191	1.319	0.193	2.792
AVESI	0.253	1.818	0.074	2.578
AVESQ	0.035	0.284	0.778	2.066
AVEED1	-0.132	-1.367	0.177	1.236
AVEED2	0.279	2.539	0.014	1.606
$R^2 = 0.564$, F = 12.483, $p = 0.000$ (ANOVA Table)				
Durbin Watson = 1.777				

Table 7.5
Model 2 Regression Analysis for Independent Variables and Mediating Variable to Dependent Variables

Model	*Standardized Coefficients Beta*	*t-value*	*p-value*	*Collinearity Statistics (VIF)*
AVEJV	0.261	3.296	0.002	1.228
AVESE	–0.058	–0.452	0.653	3.222
AVESI	0.117	0.995	0.324	2.707
AVESQ	–0.042	–0.408	0.685	2.108
AVEED1	–0.118	–1.476	0.145	1.237
AVEED2	0.220	2.407	0.019	1.630
AVEBR	0.601	5.305	0.000	2.507
$R^2 = 0.708$, F = 28.147, $p = 0.000$ (ANOVA Table)				
Durbin Watson = 1.777				

In model 3, was tested on the relationship between all the independent variables and mediator variable. R square value, which is 0.601and the F value is 14.568, as well as the Durbin Watson value is 1.9, which is within the range of 1.5 to 2.5. Based on the significant value, supplier engagement and supplier infrastructure significant toward buyer supplier relationship. Others variables is insignificant toward minimizing inventory cost due to the significant value is great than 0.1. Thus with above result and hypothesis testing were summarize in Table 7.6.

Table 7.6
Model 3 Regression Analysis for Independent Variables to Mediating Variable

Model	*Standardized Coefficients Beta*	*t-value*	*p-value*	*Collinearity Statistics (VIF)*
AVEJV	0.067	0.731	0.468	1.216
AVESE	0.414	2.990	0.004	2.792
AVESI	0.226	1.699	0.095	2.578
AVESQ	0.129	1.085	0.283	2.066
AVEED1	-0.024	-0.257	0.798	1.236
AVEED2	0.098	0.935	0.354	1.606

$R^2 = 0.601$, $F = 14.568$, $p = 0.000$ (ANOVA Table)
Durbin Watson = 1.9

In this study, just in time and vendor managed inventory revealed positively significant relationship toward minimizing inventory cost of SMEs companies in Malaysia. This finding is align with the past literatures which research provides evidences of the significant effect of the minimizing inventory cost which consistent on Yasin et al. (1997). Manufacturer maximum and minimum inventory level could help the supplier to decide the optimum for restock schedule (Kaipia & Transken, 2002). With the better decision making by the supplier for restock on time delivery the raw materials, which could lead the high satisfaction from the manufacturer on their supplier delivery performance.

Other than that, electronic data interchange system_2 (ED2) would consist of the collaboration within the trading partners in implementation of EDI which could help to enhance efficiency of the job for all parties. Based on Ngai and Gunasekaran (2004), helped in increasing communication efficiency could improved the material flow. This study, electronic data interchange system_2 is positively significant relationship toward the minimizing inventory cost.

Besides that, supplier infrastructure will show the significant relationship because of the flexibility manufacturing which could meet the buyer requirement and needs especially inventory requirement. Supplier is flexibility in manufacturer and supplier design could meet the customer requirement such like ordering type and ordering quantity. With the flexibility manufacturing, supplier could support with least lead-time and the Hsu et al. (2013) mentioned supplier ability was increase the capable to meet customer requested delivery date. Material could received on the right time with the right quantity could reduce the safety stock level for organization and in long term, it could reduce the minimizing inventory cost.

However, supplier engagement fails to support positive significant relationship in minimizing inventory cost. Supplier engagement is the first phase of purchasing activity and delivery order will be the intermediate phase, which included the inventory level (Tarig Khidir Eltayeb et al., 2010). Besides that, supplier engagement is just common communication may not show the capability of the supplier to support the raw materials on time and the communication do not promise buyer is placing order to the supplier as well as do not show there is demand would need the supplier to support. Furthermore, supplier quality was showing same result as supplier engagement. This study was failed to show the positive relationship between supplier quality and minimizing inventory cost. Quality usually is focus on the product thus superior product quality may incur high cost. Therefore, supplier quality is positive relationship with pricing.

Superior supplier quality would be implied with high pricing, thus it could cause high purchase cost for manufacturers. Consequently, SME manufacturers will rather to maintain the buffer stock to support the production and the buffer stock need to be replaced or renew if the raw material is perishable such as the raw material us in food industry.

5. CONCLUSIONS

The purpose of this study is to create awareness of the importance of inventory cost reduction for SMEs and the major aim is to identify the factors that are influencing how SME manufacturers can minimize their inventory cost. From the data collection and analysis, the regression results show that, there are two variables that are highly influencing on minimizing manufacture inventory cost such as implementation of just in time or vendor managed inventory, joint implementation of electronic data interchange as well as supplier infrastructure. This is because of suppliers who has the good infrastructure could improve the flexibility of supplier chain. The flexibility of system could increase the trust and confidence between both of the supplier and buyer could increase the possibility of optimising the cost.

Besides that, the result also shows that, supplier engagement is insignificant in influencing towards minimizing inventory cost. This is because of supplier engagement may just involve in the beginning of the purchasing activities or in the beginning of new product development. Inventory cost reduction also not influenced by supplier quality due to the fact that quality is a measure on the system and daily activities. Therefore, the quality of the supplier is mostly related on their product and process, which may not directly affect to the inventory cost. In addition, based on the hierarchical regression analysis, on the buyer supplier relationship which act as a mediator variable in order to study the enhancement significance in minimizing inventory cost. The analysis results showed that the buyer supplier relationship mediates the implementation of just in time and vendor managed inventory as well as join participate of the all the trading partners in implementation of electronic data interchange system within the firm provide the solution to minimize the inventory cost for the SME manufacturers. The inventory cost need to be carefully analysed, as it is direct impact to firm's finance performances.

Besides that, the uncertainty from supplier engagement and technology impact on increasing the transaction cost in terms of minimizing the inventory cost. The engagements of supplier do not show the cordial relationship between the supplier and buyer would not help in reduction of firm inventory. Consequently, maintaining the buyer supplier relationship in supply chain management is highly important especially when implementation of lean delivery such as just in time and vendor managed inventory are taking place.

Besides that, based on the analysis, there are around 96.9 percent of the SME manufacturers in this research concerned on the minimization of inventory cost as their primary organization's objective. Most of them feel that customized inventory information system is very important to minimize the inventory cost (89.2 percent). Therefore, this study is important in minimizing inventory cost especially for SME manufacturers because financial performance is the primary element to determine the overall profit (Suzari Abdul Rahim & Jayaraman 2014). Consequently, sustainable supply chain through right methodology could help the firm to reduce the financial cost in terms of appropriate inventory level (Suhaiza Zailani et al., 2012). This study will enrich the literature and also provides scope further research in minimizing inventory cost for the SME manufacturers.

6. RECOMMENDATIONS

Inventory control problem in SME manufacturers especially manufacturing are intensive and their inventory management practices are inadequate. Besides that, member in the supply chain will only minimizing their own cost but currently the supply chain management is changing to become more cooperative supply chains. Most of the members in the supply chain would willing to collaborate in overall cost minimizing along the supply chain. Therefore, the important aspects for inventory management are systematic in operations, using technology as well as using modern methodology. SME manufacturers should increase their concern on the inventory management practices and implementing the inventory reduction strategies, which could improve the productivity, and the strategy could emphasise responsiveness of the trading partner, efficiency and accuracy in term of sharing information. Thus in this research has recommended methodology such as implement JIT and VMI as well as EDI which significant useful for reduction of inventory cost.

7. SCOPE FOR FUTURE STUDY

In future study, the research can be conducted for larger sample respondents for all the place, which could represent the Malaysia SME manufacturer populations in order to avoid, biased. Besides that, further research can be carried out for the extension of this research, the study can be conducted included other segmentation of SME such as SME in services which included retail store. Service sector could incur inventory in order to serve their customers well and lead to customer satisfaction. Besides that, the researcher can contemplated in carry out the study using the experiment measurement. With using this measurement could mitigate the limitation of encountered under cross sectional study. The further study could increases the period of study from a month to few months in order to collect more and better information.

References

Angeles, R., & Nath, R. (2000). An empirical study of EDI trading partner selection criteria in customer-supplier relationships. *Information & Management*,*37*(5), 241-25.

Chang, H. C., Ouyang, L. Y., Wu, K. S., & Ho, C. H. (2006). Integrated vendor–buyer cooperative inventory models with controllable lead time and ordering cost reduction. *European Journal of Operational Research*, *170*(2), 481-495.

Du, T. C., Lai, V. S., Cheung, W., & Cui, X. (2012). Willingness to share information in a supply chain: A partnership-data-process perspective. *Information & Management*, *49*(2), 89-98.

Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative science quarterly*, 84-110.

Ernst, R., & Kamrad, B. (1997). Allocation of warehouse inventory with electronic data interchange and fixed order intervals. *European journal of operational research*, *103*(1), 117-128.

Fink, R. C., Edelman, L. F., & Hatten, K. J. (2007). Supplier performance improvements in relational exchanges. *Journal of Business & Industrial Marketing*, *22*(1), 29-40.

Gunasekaran, A., & Ngai, E. W. (2004). Information systems in supply chain integration and management. *European Journal of Operational Research*, *159*(2), 269-295.

Hernandez, A. (1989), Just In Time Manufacturing, Prentice-Hall, Englewood Cliffs, NJ. Retrieve from http://books.google.com.my/books?id=RUOaAAAAIAAJ&q=Hernandez,+A.+(1989),+Just+In+Time+Manufacturing,+Prentice-Hall,+Englewood+Cliffs,+NJ&dq=Hernandez,+A.+(1989),+Just+In+Time+Manufacturing,+Prentice-Hall,+Englewood+Cliffs,+NJ&hl=en&sa=X&ei=F3atU6GmF8edugT7iID4DA&ved=0CDgQ6AEwAw on 25th June 2014

Hira, D.S., &Gupta, P.K., (2009). Operations Research, S. Chand & Company Ltd., New Delhi, India. Retrieve from http://books.google.com.my/books?hl=en&lr=&id=1vmxoumhCH0C&oi=fnd&pg=PA1&dq=Hira+D.S.,+Gupta+P.K.,+2009,+Operations+Research,+S.+Chand+%26+Company+Ltd.,+New+Delhi,+India&ots=58gxW0mjq9&sig=fwQFxlF-AIz6r8yjPc8Lqx6yNdA#v=onepage&q=inventory%20cost&f=false on 26th June 2014

Holweg, M. (2005). The three dimensions of responsiveness. *International Journal of Operations & Production Management*, *25*(7), 603-622.

Hong, X. P., Wang, C., Lei, X. & Ali, D. (2016). Multiple- vendor, multiple-retailer based vendor managed inventory. *Annals of Operation Research, 238*(1), 277-297.

Hsu, C. C., Kannan, V. R., Leong, G. K., & Tan, K. C. (2006). Supplier selection construct: instrument development and validation. *International Journal of Logistics Management, 17*(2), 213-239.

Hyland, P. W., Soosay, C., & Sloan, T. R. (2003). Continuous improvement and learning in the supply chain. *International Journal of Physical Distribution & Logistics Management*, *33*(4), 316-335.

Jean, R. J., Sinkovics, R. R., & Hiebaum, T. P. (2014). The Effects of Supplier Involvement and Knowledge Protection on Product Innovation in Customer–Supplier Relationships: A Study of Global Automotive Suppliers in China. *Journal of Product Innovation Management*, *31*(1), 98-113.

Kaipia, R., Holmström, J., & Tanskanen, K. (2002). VMI: What are you losing if you let your customer place orders?. *Production Planning & Control*, *13*(1), 17-25.

Kamath, R. R., & Liker, J. K. (1990). Supplier dependence and innovation: a contingency model of suppliers' innovative activities. *Journal of Engineering and Technology Management*, *7*(2), 111-127.

Kawai, T., Sakaguchi, J., & Shimizu, N. (2013). Transition of buyer-supplier relationships in Japan: Empirical evidence from manufacturing companies.*Journal of Accounting & Organizational Change*, *9*(4), 427-447.

Keng Lin Soh, K. Jayaraman, Teoh Su Yen, S. Kiumarsi (2016). The role of suppliers in establishing buyer-supplier relationship towards better supplier performance, International Journal of Productivity and quality Management, 17(2), 183-197.

Krittanathip, V., Cha-um, S., Suwandee, S., Rakkarn, S., & Ratanamaneichat, C. (2013). The Reduction of Inventory and Warehouse Costs for Thai Traditional Wholesale Businesses of Consumer Products. *Procedia-Social and Behavioral Sciences*, *88*, 142-148.

Lai, K. H., Cheng, T. C. E., & Yeung, A. C. (2005). Relationship stability and supplier commitment to quality. *International Journal of Production Economics*,*96*(3), 397-410.

Lida, T. (2012). Coordination of cooperative cost-reduction efforts in a supply chain partnership. *European Journal of Operational Research*, *222*(2), 180-190.

Lwiki, T., Mugenda, N. G., & Wachira, V. K (2013). The Impact of Inventory Management Practices on Financial Performance of Sugar Manufacturing Firms in Kenya. International Journal of Business, Humanities and Technology, 3(5), 75-85.

Mirza Abdullah, Suhaiza Zailani, Mohammad Iranmanesh, K. Jayaraman (2015). Barriers to Green Innovation Initiatives among Manufacturers: The Malaysian Case, Review of Managerial Science, 1-27.

Nurul Hayati AH, Noriah Y, Roseleena J, Ahmend J, Nur A'in K, Nur Nida Azira F (2015). Effective Material Handling System for JIT Automotive Production Line. *Procedia Manufacturing* 2, 251-257.

Park, J., Shin, K., Chang, T. W., & Park, J. (2010). An integrative framework for supplier relationship management. *Industrial Management & Data Systems*,*110*(4), 495-515.

Prior, D. D. (2012). The effects of buyer-supplier relationships on buyer competitiveness. *Journal of Business & Industrial Marketing*, *27*(2), 100-114.

Qi, W. & Yu, L. Q, (2010).Information sharing In Supply Chain Management. Ninth *International Symposium on Distributed Computing and Application to Business, Engineering and Science.*

Samak-Kulkarni, S. M., & Rajhans, N. R. (2013). Determination of Optimum Inventory Model for Minimizing Total Inventory Cost. *Procedia Engineering*, *51*, 803-809.

Schniederjans, M. J., & Cao, Q. (2001). An alternative analysis of inventory costs of JIT and EOQ purchasing. *International Journal of Physical Distribution & Logistics Management*, *31*(2), 109-123.

Son, J. Y., Narasimhan, S., Riggins, F. J., & Kim, N. (2008). Understanding the development of IOS-based trading partner relationships: a structural model with empirical validation. *Journal of Organizational Computing and Electronic Commerce*, *18*(1), 34-60.

Rajagopal, A. R. (2009). Buyer–supplier relationship and operational dynamics.*Journal of the Operational Research Society*, *60*(3), 313-320.

Rashed, C. A. A., Azeem, A., & Halim, Z. (2013). Effect of information and knowledge sharing on supply chain performance: a survey based approach.*Journal of Operations and Supply Chain Management*, *3*(2), 61-77.

Squire, B., Cousins, P. D., Lawson, B., & Brown, S. (2009). The effect of supplier manufacturing capabilities on buyer responsiveness: the role of collaboration. *International Journal of Operations & Production Management*,*29*(8), 766-788.

Srinivasan, M., Mukherjee, D., & Gaur, A. S. (2011). Buyer–supplier partnership quality and supply chain performance: Moderating role of risks, and environmental uncertainty. *European Management Journal*, *29*(4), 260-271.

Suhaiza Zailani, K. Jayaraman, G. Vengadasan, R. Premkumar (2012). Sustainable supply chain management (SSCM) in Malaysia: A survey, International Journal of Production Economics, 140 (1), 330–340.

Suzari Abdul Rahim, K. Jayaraman (2014). Sustainable Financial Supply Chain in Global Manufacturing Companies, International Journal of Organizational Innovation, Special Issue, 18-29.

Tarig Khidir Eltayeb, Suhaiza Zailani, K. Jayaraman (2010). The examination on the drivers for green purchasing adoption among EMS 14001 certified companies in Malaysia, Journal of Manufacturing Technology Management, 21 (2), 206-225.

Todeva, E., & Knoke, D. (2005). Strategic alliances and models of collaboration. *Management Decision*, *43*(1), 123-148.

Thiel, D., Hovelaque, V., & Thi Le Hoa, V. (2010). Impact of inventory inaccuracy on service-level quality in (< i> Q</i>,< i> R</i>) continuous-review lost-sales inventory models. *International Journal of Production Economics*,*123*(2), 301-311.

Vijayasarathy, L. R., & Robey, D. (1997). The effect of EDI on market channel relationships in retailing. *Information & Management*, *33*(2), 73-86.

Waller, M., Johnson, M. E., & Davis, T. (1999). Vendor-managed inventory in the retail supply chain. *Journal of business logistics*, *20*, 183-204.

Weigelt, C. (2013). Leveraging supplier capabilities: the role of locus of capability deployment. *Strategic Management Journal*, *34*(1), 1-21.

Yasin, M. M. & Wafa, M. A., (1998). A conceptual framework for effective implementation of JIT: An empirical investigation. *International Journal of Operations and Production Management*, *18*(11), 1111-1124.