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MEDIATING EFFECT OF MANAGEMENT INFORMATION SYSTEM (MIS): WAREHOUSE OPERATION EFFICIENCY IN SMALL AND MEDIUM ENTERPRISES (SMES) PERSPECTIVE

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ABSTRACT.

This study investigates the relationship between the influential warehouse efficiency and warehousing operations, applied by the Small-Medium Enterprises (SMEs) manufacturing firms in Malaysia. These perspective research objectives are to determine whether there is any relationship between the warehousing operations, and warehousing Management Information System (MIS). It also examines the mediating effect of warehousing MIS in the relationship between warehousing attributes and warehouse efficiency. A quantitative method approach is applied in this research methodology. Three hypotheses have been proposed for the research with data collected from the survey of 182 SME manufacturing firm owners in Malaysia as listed in the SME Directory (2009). The findings indicate that the warehousing MIS significantly mediates and has an effect on the warehousing operations and their relationship with warehouse efficiency in the SME manufacturing firms. Theoretically, the research contributes to the growth development of the warehouse efficiency theories. Practically it could facilitate the owners or warehouse managers of the manufacturing firms in making the right management decisions regarding warehousing. As a conclusion, this study provides new knowledge and important insights of warehousing operations that will benefit manufacturing firms and other related industries, particularly for SMEs in Malaysia.

Keywords: *Warehouse efficiency, operations, management information system (MIS), mediating effect and semi-medium enterprises (SMES).*

INTRODUCTION

Issues on warehouse efficiency (general logistics management) are specifically but not comprehensively studied until after the business globalisation process takes place (Rosena, HarlinaSuzana,&Sabariah, 2008;Osman & Hariri, 2009; Ismail, Hashim, Ghani, Zulkifli, Kamilah,& Rahman, 2009). The problems keep on developing and continuing with the evolution of logistics roles that became more complex, which took place actively after the 1990s (Bardi, Coyle,&Novack, 2006; Gundlach, Bolumole, Eltanway,& Frankel, 2006).

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This especially became critical within the last two decades in the supply chain networks, in which warehouse has become an integral part of the major logistics service providers (Sink, Langley & Gibson, 1996; Lambert, Stock,&Ellram, 1998; Coyle, Bardi,& Langley, 2003; Koster, Le Duc,& Roodbergen, 2007). In practice warehouse is defined as a planned space for the storage and handling of goods and materials (Emmett, 2005), with large building and it plays an important part in the organization related to its business purpose (Tompkins, & Smith, 1998; Frazelle, 2002). Lambertet al. (1998) described warehouse activities are more focus on the core competencies of the operational which could satisfy customers' expectation on the shorter delivery of time and more accurate services. Meanwhile, Stock and Lambert (2001) suggested that there are six types of public warehouses, namely general merchandise for manufactured goods, refrigerated or cold storage, bounded, household goods and furniture, special commodity and bulk storage warehouse.

Rouwenhorst, Reuter, Stockrahm, Van, Mantel and Zijm(2000) mentioned that the efficiency and effectiveness in any distribution network in turn is largely determined by the operation of the nodes as the warehouses.However, Koster and Warffemius (2005) argued that complexity of a warehouse operation has a large impact on the performance of the warehouse, and in this case the efficiency of the warehouse. In addition, Gunasekaran, Marri and Menci. (1999) depicted that warehousing comprises of six major operations throughput activities which are receiving, transfer, handling, storage, packing and expediting. In conclusion, timely and accurate information about products, resources and processes are essential in order to operate an appropriate planning and controlling structure for achieving high performance of warehousing operation in today's marketplace (Faber, Nynke, Koster, Renus,& De Velde, 2002).Research by Gu, Marc, and Leon (2006) analyzed that warehouses are an essential component of any supply chain and play major roles, including (a) buffering the material flow along the supply chain to accommodate variability caused by factors such as product seasonality and/or batching in production and transportation; (b) consolidation of products from various suppliers for combined delivery to customers, and (c) value-added processing such as kitting, pricing, labeling, and product customization. Such important activities require an efficient warehouse management to ensure excellent services to be rendered are maintained all the time.

On the other hand, Murphy, and Poist (1993) argued that warehouse as the most costly activities in logistics perspective because its operation need labor intensive in order to enhance operational and organizational performance. However, Ellinger, Ellinger, and Keller (2005) believed that any companies wishing to remain competitively effective in the logistics (and warehousing) industry would increasingly evaluate the feasibility of adopting more people oriented on the growth and development aspects. Nowadays, in the era of globalization and technology, modern warehousing are more concerns on speed and efficiency that related to the automation, computerization and communication among the stakeholders (Jenkins, 1990). In general, warehouse efficiency and effectiveness could be measured in term of warehouse safety, shipping errors, on-time shipments, customer problems, cost per line shipped and total warehouse expenses incurred (Lambert et al., 1998). For the companies to create efficiencies; warehouse quality performance is used to determine whether warehouse efficiency are put away, inventory, picking and shipping accuracy factors been considered (Frazelle, 2002). Therefore in SMEs manufacturing sector, activities involved are such as the processing of raw materials, including food,

beverages, textiles, petroleum, wood, rubber and the assembly and manufacturing of electrical and electronics appliances and components (Saleh,&Ndubisi, 2006a). The Annual SME Report 2008 emphasized that Malaysia's target is to increase the contribution of SMEs to Gross Domestic Product (GDP) from the 32 percent charted in 2005 to 37 percent, exports from 19 percent to 22 percent and employment from 56 percent to 57 percent by the year 2010 (Saleh,&Ndubisi, 2006a).According to the latest figure issued by Ministry of International Trade and Industry Malaysia (MITI) (2006), as shown in Table 1.1, the largest concentration of SMEs in the year 2003 are in the textile and apparel sector (23.20 percent), followed by food and beverages (15.00 percent), metal and metal products (12.40 percent), and paper printing and publishing (9.20 percent).

Table 1.1:
Distribution of SMEs in the Manufacturing Sector in 2003

Sub-Sector	Total Number of establishments	SMEs	
		Number	Share (%)
Textile & Apparel	8,855	8,779	23.20
Food & Beverages	5,804	5,664	15.00
Metal & Metal Products	4,809	4,686	12.40
Paper, Printing & Publication	3,549	3,483	9.20
Furniture	2,352	2,286	6.00
Rubber & Plastics Products	2,343	2,166	5.70
Wood & Wood Products	2,149	2,052	5.40
Non Metallic Mineral Products	1,708	1,650	4.40
Machinery & Equipment	1,435	1,390	3.70
Electrical & Electronics	1,362	1,077	2.80
Chemical and Chemical Products	1,115	1,047	2.80
Transport Equipment	769	699	1.80
*General Manufacturing	2,969	2,887	7.60
Total	39,219	37,866	100.00

Source: MITI (2006)
**Include jewellery, leather products; tobacco products; medical, precision and optical instruments; and recycling and petroleum products.*

In his study, the researchers applied the Lewin's Force Field Theory as the underpinning theory of the research as it explains the imperative transformation in the production process, product design and quality (Saud, 2005), service delivery and other aspects of business enterprise (Abdullah, 2010; Elsey, Barry and Tse, 2007), including the logistics (warehousing as one of its major services providers. These impacts the warehouse company's structures strategies, policies, budgets, rewarding systems, learning and competency, the attitudes and behavior of the work force that could be related to warehouse efficiency. Meanwhile, Elseyet al. (2007) suggested that the contribution of Lewin's Force Field Theory lays in its emphasis on the dynamics of organizational change with two forces impacting each other or Lewin (1946) called "quasi stationary equilibrium". This theory led to the development of Lewin's 3-Steps Change Model: Unfreeze, Freeze and Refreeze. Therefore, Lewin's Force Field Theory is all about the need to make changes, making changes and finally

maintain the changes made in order to make that particular change to be more effectives.

Research Questions

- To determine whether there is any relationship between the warehousing operation and warehouse efficiency.
- To determine whether there is any relationship between the warehousing operations and warehousing MIS.
- To examine the mediating effect of warehousing MIS in the relationship between warehousing operations and warehouse efficiency.

Research Objectives

- To determine whether there is any relationship between the warehousing operation and warehouse efficiency.
- To determine whether there is any relationship between the warehousing operations and warehousing MIS.
- To examine the mediating effect of warehousing MIS in the relationship between warehousing operations and warehouse efficiency.

Hypotheses

- There is a relationship between the warehousing operation and warehouse efficiency.
- There is a relationship between the warehousing operations and warehousing MIS.
- There is a mediating effect of warehousing MIS in the relationship between warehousing operations and warehouse efficiency.

Theoretical Framework

This study recognizes that the warehouse management related to its operations and MIS play crucial roles in achieving the desired warehouse efficiency and performance. Figure 1.0 depicts the theoretical research framework and hypothetical relations.

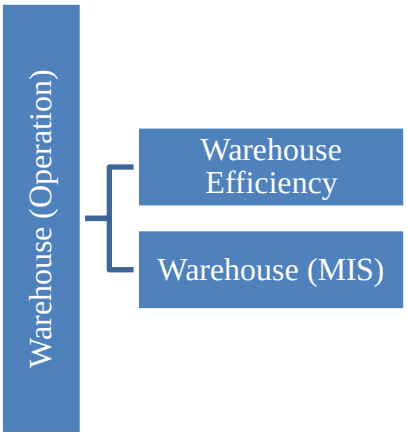

Figure 1.0:
Theoretical Research Framework

METHODOLOGY

The target population for this study is SMEs manufacturing firms in Malaysia which are listed under the SME Business Directory (2009). It is obtainable at http://secure.smeinfo.com.my. According to UNDP (2007), a total of 16,515 SMEs in Malaysia are listed according to the business sectors with manufacturing dominated the sector with 5,947 SMEs, including Agro based. Specifically, the study used all the firms listed in the SME Business Directory in various manufacturing sectors: food & beverages, metal & metal products, wood & wood products, paper and printing publication, machinery & engineering, plastics products, electrical & electronics, non-metallic mineral product, other (jewellery), petro chemical and chemical, transport equipment, rubber & rubber products, and leather. SMEs owners are given the questionnaire surveys for them to response.

In this research, the total numbers of SMEs manufacturing sectors are 5,947 and through postal services, as required by Krejcie and Morgan (1970), a total of 1,000 questionnaires are sent to SMEs manufacturing owners throughout Peninsular Malaysia. However, out of 1,000 questionnaires posted to the population, only 220 responded and only 182 are found to be useful for the studies, which the overall response rate is 18.9 percent or 19 percent (round-up). This is deemed acceptable response rate for top management or their representatives' questionnaires in social science research (Menon, Sundar& Roy, 1996; Baruch, 1999). Research questionnaires are designed based on the framework variables that are the warehouse efficiency, operation and MIS with a total of 42 questions. Respondents are required to determine the degree to which the items based on a Likert Scale, which are 1 = 'strongly disagree' to 5 = 'strongly agree' for the extent of their usage in the warehouse efficiency and management performance. Test on the mediating role of warehouse efficiency was based on a multiple linear regressions, as suggested by Baron and Kenny (1986) and Sobel Test was conducted accordingly.

FINDINGS

It is necessary to gauge the extent of reliability of the instrument used in the study. Thus the necessary test is carried out. Ideally the Cronbach α coeffiecient of a scale should be a least (Hair, Anderson &Tatham, 1995). Based on Table 1.2 the pre-test and post-test modes indicate that the instruments are highly reliable.

Table 1.2:
Cronbach α Coefficient of Reliability (Pre-Test and Post-Test Analysis)

Constructs	No. of Items Pre-test	No. of Items Post-test	Reliability Index Pre-test (n: 30)	Reliability Index Post-test (n: 182)
Warehouse Efficiency	21	18	0.814	0.945
Warehouse Operations	5	4	0.757	0.921
Warehouse MIS	12	10	0.835	0.859

Peter (1979) stated that validity refers to the extent to which a measurement tool actually measures the construct that is used to measure. In this study, the Bartlett test of sphericity and the Kaiser Meyer Okin (KMO) measure of sampling adequacy (SMA) are used to investigate the validity of the constructs. The statistical scores of this test for all constructs are shown in Table 1.3. Therefore, it is concluded that all the questions used in the questionnaires (Warehouse Efficiency, Warehousing Operation and Warehousing MIS) are mostly valid as the results are 0.70 and above is sufficiently large to permit factor analysis to represent the validity constructs (Hair, Black, Babin, Anderson, &Tatham, 2006)

Table 1.3:
Investigating Validity: Results of KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity.

Constructs	Kaiser Meyer-Okin Measure (KMO) of Sampling Adequacy	Bartlett Test of Sphericity
Warehouse Efficiency	0.887	3950.906
Warehousing Operation	0.756	609.759
Warehousing MIS	0.790	1223.955

A correlation analysis is used to evaluate the strength and direction of the linear relationships between two variables (Pallant, 2007). The study found that the Warehouse Efficiency (AWE) is significance with Warehousing Operations (AWO) above 0.7 while Warehousing MIS (AMIS) above 0.5. The study found out that AWE has a positive linear relationship with AWO and AMIS.

Hypotheses Results

Hypothesis 1: There is a relationship between the Warehousing Operation (AWO) and Warehouse Efficiency (AWE).

There is a strong relationship between AWO and AWE with its correlation coefficient 0.772 as in Table 1.4. Based on p-value 0.00 (Table 1.3), the study found that it is very significance. These reflected very significance relationships between these two variables in enhancing the warehouse efficiency activities with the implementation of warehousing operations activities. Therefore, the study found that there is a relationship between the warehousing operation and warehouse efficiency, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 2: There is a relationship between the Warehousing Operations (AWO) and Warehousing MIS (AMIS).

There is a strong relationship between WO and WM with the significance correlation 0.375 as in Table 1.4and correlation coefficient based on p-value 0.00 (Table 1.4) . These reflected very significance relationships between these two variables in enhancing the warehousing MIS activities with the implementation of warehousing operations activities. Therefore the study found that there is a relationship between the warehousing operation and warehousing MIS, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 3: There is a mediating effect of Warehousing MIS (AMIS) in the relationship between Warehousing Operations (AWO) and Warehouse Efficiency (AWE).

As in Table 1.5 and Table 1.6, it showed that Step 1 results for the significant unstandardized regression coefficient (B=0.436) indicates the Warehousing Operations affects the Warehouse Efficiency significantly ($p<0.01$). Step 2 results of the unstandardized regression coefficient (B=0.141) indicates the Warehousing Operations affects the Warehousing MIS significantly ($p<0.01$). Step 3 results of the unstandardized regression coefficient associated with the relation between the Warehousing MIS and Warehouse Efficiency are significant (0.203). This regression equation also provides an estimate of the relation between the Warehousing Operation and the Warehouse Efficiency, controlling for the Warehousing MIS (B=0.560). As in Table 1.7, it shows that the Step 4 of Sobel, Aroian and Goodman tests results are significant, $p < 0.05$. This confirms the Warehousing MIS mediates the relationship between the Warehousing Operations and Warehouse Efficiency. Therefore, the study found that there is a mediating effect by Warehousing MIS in the relationship between Warehousing Operations and Warehousing Efficiency.

Table 1.4:
Pearson Correlation (Overall) Results Summary

		AWE	AWO	AMIS
AWE	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	182		
AWO	Pearson Correlation	.772(**)	1	
	Sig. (2-tailed)	.000		
	N	182	182	
AMIS	Pearson Correlation	.518(**)	.375(**)	1
	Sig. (2-tailed)	.000	.000	
	N	182	182	182

Table 1.5:
Coefficients (Overall Summary)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.420	.157		2.677	.008
AWO		.402	.039	.483	10.286	.000
AMIS		.122	.041	.161	2.999	.003

a. Dependent Variable: AWE

Table 1.6:
Measuring the degree of influence of AMIS in the relationship between AWO and AWE

	F	R2	B	SE B	Beta	T	Sig
Step 1 Outcome: Warehouse Efficiency Predictor: Warehousing Operations	265.77	0.596	0.436	0.039	0.772	16.302	0.00
Step 2 Outcome: Warehousing MIS Predictor: Warehousing Operations	29.451	0.141	0.410	0.076	0.375	5.427	0.00
Step 3 Outcome: Warehouse Efficiency Predictor: Warehousing Operations	117.525	0.596	0.560	0.039	0.672	14.240	0.00
Mediator: Warehousing MIS			0.657	0.230	0.036	0.266	5.64 0.00

Table 1.7:
Using Sobel test as to measure the mediating effect of AMIS in the relationship between AWO and AWE

	Input		Test statistics	p-value significance
A: Warehousing Operation	0.410	Sobel test:	4.51	0.00
B: Warehousing MIS	0.394	Aroian test:	4.48	0.00
Sa: Warehousing Operation	0.076	Goodman test:	4.53	0.00
Sb: Warehousing MIS	0.048			

CONCLUSION

The results indicate the important of warehouse efficiency in the manufacturing firms. The warehouse operations and MIS are the main basic variables for process management improvement in making the warehouse to be efficient and firm performance achievable. It is through the warehousing MIS mediation to the warehousing operations that mediate positively to its relationship over the warehouse efficiency. Thus this concludes that the manufacturing firm achievement is realistically depending on the warehouse efficiency in ensuring mainly good results of inventory accuracy and space optimization that reflects the firm operational process performance. Theoretically, the research contributes to the growth development of the warehouse efficiency theories. Practically it could facilitate the owners or warehouse managers of the manufacturing firms in making the right management decisions regarding warehousing. This study too provides new knowledge and important insights of warehousing operations that will benefit manufacturing firms and other related industries, particularly for SMEs in Malaysia. Hopefully the research would

open the horizon clearly to the top management of the manufacturing firm of the importance of warehousing management and its process operations. With the globalize business is getting more competitive and volatile, the functions of warehousing operations are realistically could not be denied of its pivotal role. The remarks in practice that warehouse is liked a 'bank' and 'heart of the factory' speak the volume of its contributions to the manufacturing firms or any organizations.

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