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Relationships on Operation, Human Capital Management (HCM) and Layout of Warehouse Efficiency in Small and Medium Enterprises (SMEs): Mediating Effect of Management Information System (MIS)

ABSTRACT

Due to the globalization of business, warehouse activities are now becoming a centre of importance in ensuring the effective receiving and storing of goods and materials with efficient handling of materials in manufacturing firms. It underscores the pivotal role of logistics support in exporting goods to other destinations ideally serving as excellent hubs with accurate information, timely delivery, accurate receiving of materials and goods through efficient MIS networking. This paper focuses on warehouse efficiencies based on operations, layout, and Human Capital Management (HCM) in SME manufacturing firms and the mediating effect of the Management Information System (MIS). It discusses the introduction and processes of warehousing in logistics and supply chain activities, the roles of SMEs, the research and objectives questions, literature review, framework, methodology, hypotheses and results of the research. Lastly we would like to discuss the conclusion, contribution and future study of the research.

Keywords: Warehouse efficiency, Operations, HCM, Layout, MIS, SMEs

INTRODUCTION

Background of the Study

Issues on warehouse efficiency (or logistics management in general) specifically are not comprehensively studied until after the business globalization process takes place (Rosena, Harlina & Sabariah, 2008; Osman & Hariri, 2009; Ismail, Hashim, Ghani, Zulkifli, Kamilah & Rahman, 2009). The problems keep on developing and continuing with the evolution of the logistics roles which took place actively during that time (Gundlach, Bolumole, Eltanway & Frankel, 2006). This especially happened in the last two decades in the supply chain networks which warehouse is part of the logistics major service providers (Sink, Langley & Gibson, 1996; De Koster, Le Duc & Roodbergen,

2007; Lambert, Stock & Ellram, 1998). Tomkins and Smith (1998) described that warehouse efficiency has now become a core competency, a strategic weapon that many companies is using to enhance their positions. At the same time, the warehouse efficiency is undergoing unbelievable challenges that make it excellence become harder to achieve. Warehousing before this has been viewed as a supportive industry to other functional areas but it has now been regarded as a strategic industry on its own (Gundlach *et al.*, 2006; Sum, Teo & Ng, 2001). With the current condition of global competitiveness and supply chain concepts, it has greatly changed the direction of warehouse efficiency perspective as the research proved to be as that (Harmon, 1993). Hamel and Pralahad (1994) regarded this development when the business activities becoming more complex, competition for the future are considerably an opportunity sharing rather than market sharing. "Due to the enormous challenges being faced by the warehouses efficiency, it requires much more professional approaches than the previously adopted in planning, managing and improving in today's warehouse operations" (Tomkins & Smith, 1998).

Malaysian companies would continually increase their capabilities in the logistics services in the near future through the implementation of activities such as warehousing management, inventory replenishment and order fulfillment (Sohail & Sohail, 2003). In today's competitive business environment which many companies are strategizing to gain and share the global markets, the companies are actively taking advantage of higher production and sourcing efficiency. Keys to that success are determined by the role of the logistics function (which warehouse is one of the major service providers) in ensuring the smooth flow of materials, products and information throughout a company's supply chains (Sum *et al.*, 2001). This has greatly contributed to the changes of warehouses business perspective which required warehousing to be more efficient in their operations, HCM, layout and MIS. Due to the increasing importance of the logistics industry and warehouse efficiency, it has resulted to the expansion of the international trade as well as an active endorsement of the company's and business's globalization strategy (Rosena *et al.*, 2008).

Warehousing processes

Issues and challenges affecting warehouse efficiency processes are becoming seriously focused in managing the logistics industry, in which warehousing is part of the major logistics activities in the service providers. Other major activities related are transportation, inventory management, order processing, information system and packaging. Instead, warehousing has been a neglected area of business activity in Malaysia (Rosena *et al.*, 2008). It becomes worst as the business environments are becoming more challenging, wider and global markets have contributed to producing a large scale of products by any organizations. This creates the increase of inventories in

order to meet these demands for company operations and customer satisfactions (Ismail *et al.*, 2009).

RATIONALE OF STUDY

Not many researchers have conducted studies on warehousing efficiency and performance improvement in Malaysia, particularly related to Small Medium Enterprises (SMEs). According to Osman and Hariri (2009), it is confirmed that no firm record in terms of the numbers in the freight logistics industry (related to warehousing), and other critical details about their sizes, range of services, or status of operation whether it is local or foreign when required. Rosena *et al.* (2008) regarded that despite a remarkable expansion of the industry in the country, there have been very little published research in the area of logistics (including warehousing) and supply chain. This resulted in a very limited dissemination of information for the purpose of coordination, learning and advancement. Therefore, lack of information would influence the management to retrieve relevant data, aggregate or disaggregate data accordingly (Rosena *et al.*, 2008).

Warehousing in Malaysian SMEs

Saleh and Ndubisi (2006) analyzed that SMEs have accounted for more than 80 percent of the total manufacturing establishments in Malaysia. With favourable environmental factors, the SMEs in Malaysia are expected to transcend from their present state to undertake a more important role in order to support the requirements of Malaysia's industrialization process. However, Osman and Hariri (2009) cautioned that in order to survive, the SMEs must be able to reduce costs, improve quality and provide a rapid response to the customer's needs. One of the ways of achieving that competitive edge is through the implementations of the best logistics (and warehousing) practices (Osman & Hariri, 2009).

Problem Statements

Gunasekaran et al (1999) mentioned there is not much research that addresses the improvement of warehousing operations in real life situations. There is also no empirical research on the HRM aspects of warehousing (Murphy & Poist, 1992). Even the warehouse layout as the perfect examples of fundamentals are often neglected (Gunasekaran *et al.*, 1999). Gu et al (2006) mentioned that despite the interest in information, little research to date has examined system level "smart" technologies, i.e. those that process data into a usable format for decision making in logistics operations, or in this case MIS in warehouse.

Research Questions

(1)Is there any relationship between the warehousing operation and warehouse efficiency?
(2) Is there any relationship between the warehousing operation and warehousing MIS?
(3) Is there any mediating effect of warehousing MIS in the relationship between warehousing operation and warehouse efficiency?
(4) Is there any relationship between the warehousing HCM and warehouse efficiency?
(5) Is there any relationship between the warehousing HCM and warehousing MIS?
(6) Is there any mediating effect of warehousing MIS in the relationship between warehousing HCM and warehouse efficiency?
(7) Is there any relationship between the warehousing layout and warehouse efficiency?
(8) Is there any relationship between the warehouse layout and warehousing MIS?
(9) Is there any mediating effect of warehousing MIS in the relationship between warehousing layout and warehouse efficiency?

Research Objectives

(1)To determine whether there is any relationship between the warehousing operation and warehouse efficiency.
(2) To determine whether there is any relationship between the warehousing operations and warehousing MIS.
(3) To examine the mediating effect of warehousing MIS in the relationship between warehousing operations and warehouse efficiency.
(4) To determine whether there is any relationship between the warehousing HCM and warehouse efficiency.
(5) To determine whether there is any relationship between the warehousing HCM and warehousing MIS.
(6) To examine the mediating effect of warehousing MIS in the relationship between warehousing HCM and warehouse efficiency.
(7) To determine whether there is any relationship between the warehousing layout and warehouse efficiency.
(8) To determine whether there is any relationship between the warehousing layout and warehousing MIS.
(9) To examine the mediating effect of warehousing MIS in the relationship between warehousing layout and warehouse efficiency.

Significance of the Study

Practical Significance: This study would contribute the future research and put them to test in practice – both from the literature of academicians and practitioners. What most

significant is the general information of this research to facilitate the warehouse managers or manufacturing firms to help them make decisions and making it into a more efficient workplace thus enhancing the efficiency of the warehouse operations and the manufacturing firms generally. *Theoretical Significance:* This research would contribute the growth of warehouse efficiency theory to develop and to bring more input for the decision-making process in the warehouse management and SMEs manufacturing firms. With the new outcome of this research, such framework, model, matrix or guidelines proposed should be able to assist warehouse or SMEs manufacturing managers to make a better decision.

Scope and limitation of the Study

This research would focus only on Small and Medium Enterprise (SMEs) Manufacturing sector in Peninsular Malaysia, registered under the Small and Medium Industries Development Corporation (SMIDEC). Definitions of SMEs are defined differently according to respective perspective of their backgrounds, countries, variables and other factors related. The research based the SME firms list from the SME Business Directory (2009).

LITERATURE REVIEWS

Background of Malaysian SMEs, Performance and Challenges

SMEs in manufacturing sector are involved in activities 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 & Ndusi, 2006).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 in 2010.

Overview on Warehousing

In practice warehouse is defined as a planned space for the storage and handling of goods and mater (Emmett, 2005), with large building and it plays an important part in the organization related to its business purpose (Tompkins & Smith, 1998; Frazelle, 2001). Lambert *et 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. Stock and Lambert (2001) added that there are six types of public warehouses; general merchandise for manufactured

goods, refrigerated or cold storage, bounded, household goods and furniture, special commodity and bulk storage.

Warehouse Operations

Rouwenhorst *et al.* (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. 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. Gunasekaran *et al.* (1999) mentioned warehousing comprises six major operation throughput activities which are receiving, transfer, handling, storage, packing and expediting. Conclusion, timely and accurate information about products, resources and processes are essential to operate a planning and control structure to achieve high performance of warehousing operation in today's marketplace (Faber *et al.*, 2002).

Human Capital Management (HCM)

Murphy and Poist (1993) argued that warehouse as the most costly activities in logistics because a major part of its operations is labor intensive thus to improve operational and organizational performance. Ellinger, Ellinger and Keller (2005) believed that firms wishing to remain competition effectively in the logistics (and warehousing) industry would increasingly evaluate the feasibility of adopting more people oriented to focus on the growth and development. This might produce more groups of front line logistics and warehousing employees.

Layout

Hassan (2002) emphasized that designing the layout of a warehouse is a complex task and many of them are combinatorial, problems that are difficult to solve optimally. Tompkins, White, Bozer and Tanchoco (2003); Bartholdi and Hackman, (2005 and 2008) mentioned that selecting the best layout for a given case is not trivial because of the diversity of factors influencing the warehouse operation such as docks location, aisles access, racks types, racks access etc. Conclusion, Gopalkrishnan, Turuvekere and Gupta (2004) regard the type of layout utilized would largely depend on the nature of the manufacturing activities including the volume and variety of the products being produced.

Management Information System (MIS)

Autry, Griffis, Goldsby and Bobbitt (2005) specified that the need for data management to support logistics processes has created demand for specialized information systems and custom-designed for logistics management needs. As results, many firms begun to invest in technologies that enhance decision make capabilities for transport management, warehouse management, and demand forecasting and planning among others (Bowersox, Closs, and Stank, 1999). Conclusion, in warehousing, information on inbound and outbound flows, weight and volume of stored products by type and cost of inventory are necessary (Pokharel, 2005).

Warehouse Efficiency

Modern warehousing concerns speed and efficiency related to automation, computerization and new means of communication (Jenkins, 1990). Warehouse efficiency and effectiveness can be measured by safety, shipping errors, on-time shipments, customer problems, cost per line shipped and total warehouse expenses (Lambert *et al.*, 1998). To create efficiencies, warehouse quality performance is used to determine warehouse efficiency which are put away, inventory, picking and shipping accuracy (Frazelle, 2002).

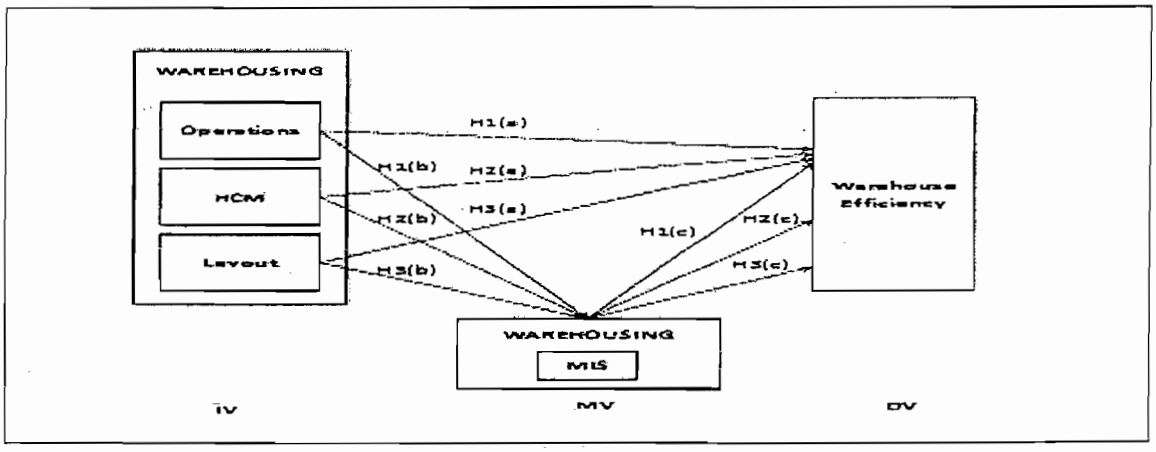
Theoretical Underpinning Theories

Based on the past literatures and research, Lewin's Force Field Theory explains the imperative transformation in production process, product design and quality, service delivery and other aspects of business enterprise (Elsey, Barry and Tse, 2007). This impacts the structures strategies, policies, budgets, reward systems, learning and competence, the attitudes and behavior of the work force that can be related to warehouse efficiency. Elsey *et al.* (2007) analyzed that the contribution of Lewin's Force Field theory lays in its emphasis on the dynamics of organizational change which suited the overall thinking as it deals 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 effectiveness of change. With additional 3-Steps Change Model, these theories could determine that such supports to improve the changes of activities in the organizations have encouraged everyone to focus on the intended situation to enhance the plan to be achieved.

OVERVIEW OF THEORETICAL FRAMEWORK AND HYPOTHESES

This study recognizes that the warehouse management related to its operations, HCM, layout and MIS play crucial roles in achieving the desired warehouse efficiency and performance. Specifically it could be divided into two major perspectives: practical and

theoretical significance, as explained in the research gaps identified in the literature review. **Figure 1** depicts the theoretical research framework and hypothetical relations [Hypothesis 1a [H1(a)]; Hypothesis 1b [H1(b)]; Hypothesis 1c [H1(c)]; Hypothesis 2a [H2(a)]; Hypothesis 2b [H2(b)]; Hypothesis 2c [H2(c)]; Hypothesis 3a [H3(a)]; Hypothesis 3b [H3(b)]; and Hypothesis 3c [H3(c)] in an attempt to address the objectives of this research.



Relationships among warehousing factors

A firm that knows its warehousing factors and its capable to fully utilize them would have better potential to confront the efficiency of its process, functions, activities and management. For example, a firm that exercises best practices in inventory control and accuracy in operation, space saving in the layout, trained personnel and HCM, latest MIS updating on its software and hardware and 5S working spirits within the organization, could improve its quality, innovativeness and productivities tremendously. Thus this enhances its efficiency. Due to the gap existing in the literature in studying the role of warehousing MIS as a mediating variable in the relationship between the warehousing operations, warehousing HCM and warehousing layout, this study used the similarity of attributes existing in these factors. The same attributes are applied to the problems related relationship between the warehousing operations, warehousing HCM, warehousing layout and warehousing MIS.

Development of Hypotheses

In relation to that, the objectives of this study are to investigate the relationship between these factors and their effect on organizational performance either as independent variables or mediating variable (refer to **Figure 1**). As mentioned earlier, the factors used in this study are: (1) warehousing operations; (2) warehousing HCM; (3)

warehousing layout and; warehousing MIS (4). Nine hypotheses have been developed based on the research framework for the research measurements with numbers of questions on questionnaires with related hypotheses and linkages with the research questions and objectives. The details of the hypotheses are:

Hypothesis 1(a): There is a relationship between the warehousing operation and warehouse efficiency.
Hypothesis 1 (b): There is a relationship between the warehousing operations and warehousing MIS.
Hypothesis 1 (c): There is a mediating effect of warehousing MIS in the relationship between warehousing operations and warehouse efficiency.
Hypothesis 2 (a): There is a relationship between the warehousing HCM and warehouse efficiency.
Hypothesis 2 (b): There is a relationship between the warehousing HCM and warehousing MIS.
Hypothesis 2 (c): There is a mediating effect of warehousing MIS in the relationship between warehousing HCM and warehouse efficiency.
Hypothesis 3 (a): There is a relationship between the warehousing layout and warehouse efficiency.
Hypothesis 3 (b): There is a relationship between the warehousing layout and warehousing MIS.
Hypothesis 3 (c): There is a mediating effect of warehousing MIS in the relationship between warehousing layout and warehouse efficiency.

METHODOLOGY

Specifically this study analyzes the relationship between the warehouse efficiency factors and the effect to the organizational performance among the SME manufacturing firms in Malaysia. Four independent variables and one mediating variable are selected in this study based on a review of the effect of the variables on organizational performance. It is noted that the study of the current framework is the new one.

Research Population and Sample

The target population for this study is SMEs manufacturing firms in Malaysia which are listed under the SME Business Directory (2009). According to BNM (2007), cited by UNDP (2007), a total of 16,515 SMEs in Malaysia are listed according to 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. Owners, factory managers or warehouse managers or warehouse section heads are given the questionnaire surveys for them to response.

Research Sampling Size and Technique

In this research, the total numbers of SMEs manufacturing sectors are 5,947 and through postal services, 1,000 questionnaires are sent to SMEs manufacturing owners / factory managers / warehouse managers / warehouse section heads 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 Instrument and Construction

Research questionnaires are designed based on the framework variables that are the warehouse efficiency, operation, HCM, layout and MIS with a total of 42 questions. Respondents are required to determine the degree to which the items on a Likert Scale are 1 = 'strongly disagree' and 5 = 'strongly agree' for the extent of their usage in the warehouse efficiency and management performance.

Data Collection and Analysis

The data are analyzed using the SPSS Version 19 program. Non-respondent characteristics are studied in order to check if the lack of response is significant. The collected data are summarized, analyzed, interpreted and presented to address the research objectives that prompted the entire research process. Linear regressions and Sobel test are used.

Research Reliability

It is necessary to gauge the extent of reliability and validity for each of the instruments used in the study. Thus all the necessary tests are carried out. Ideally the Cronbach α coeffiecient of a scale should be a least 0.7 (Hair *et al.*, 1995). The pre-testing exercise is done in mid May 2010 with 50 SMEs manufacturing firms listed in the SMI Business Directory 2009 but only 36 of the pre-tested sampling are returned with only 30 are found useful. According to Roscoe (1975), a sample size of more than 30 but less than 500 was appropriate for most research. **Table 1** gives the alpha coefficient of reliability

in the pre-test and post-test analysis of the research instrument. Based on the pre-testing exercise, all the items for each construct post a Cronbach α value of as low as 0.70 as high as 0.99. This means the rules tests in the pre-test and post-test modes indicate that the instruments are highly reliable.

Table 1
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 HCM	5	5	0.713	0.794
Warehouse Layout	5	5	0.900	0.926
Warehouse MIS	12	10	0.835	0.859

Research Validity

Nunnelly (1978) defined validity as the degree to which measurement scale measures what it is intended to measure. Peter (1981) 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 2**. Therefore, it is concluded that all the questions used in the questionnaires (Warehouse Efficiency, Warehousing Operation, Warehousing HCM, Warehousing Layout and Warehousing MIS) are mostly valid as the results are 0.50 and above is sufficiently large to permit factor analysis to represent the validity constructs.

Table 2:
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 HCM	0.793	652.894
Warehousing Layout	0.845	1196.652
Warehousing MIS	0.790	1223.955

Correlation Analysis

A correlation analysis is used to evaluate the strength and direction of the linear relationships between two variables (Pallant, 2007). Based on this study, summary analyses of the overall Pearson Correlations (see **Table 3)** are conducted. That is the best value or perfect correlation is $-1 \leq \rho \leq 1$.For the correlation coefficient, anything that is below 0.05 or ≤ 0.05 is considered significant or positive and anything that is above than that is considered not significant or negative. Conclusion, the study found that the Warehouse Efficiency (AWEC) is significance with all the variables with Warehousing Operations (AWOC) and Warehousing Human Capital Management (AHCMC) are above 0.7 while Warehousing MIS (AMISC) above 0.5 and Warehousing Layout (ALC) 0.24. It reflects the correlation significant activities being carried out in the warehouse in maintaining its efficiency

Table 3:

Pearson Correlation (Overall) Results Summary

		AWEC	AWOC	AHCMC	ALC	AMISC
AWEC	Pearson Correlation	1				
	Sig.					
	N	182				
AWOC	Pearson Correlation	.772(**)	1			
	Sig.	.000				
	N	182	182			
AHCMC	Pearson Correlation	.744(**)	.570(**)	1		
	Sig.	.000	.000			
	N	182	182	182		
ALC	Pearson Correlation	.240(**)	.071	.199(**)	1	
	Sig.	.001	.339	.007		
	N	182	182	182	182	
AMISC	Pearson Correlation	.518(**)	.375(**)	.405(**)	.633(**)	1
	Sig.	.000	.000	.000	.000	
	N	182	182	182	182	182

especially the operations and HCM but less performance by layout. In the correlation significance test based on *p-value* or significance, the study found AWE with other variables are significance reflecting AWE have positive linear relationship with AWOC, AHCMC, ALC and AMISC.

Multiple Linear Regressions

Upon the completion of correlation analysis and multiple regressions analysis using the SPSS Version 19 are performed to find any influence between the independent variables (Warehousing Operations, Warehousing HMC and Warehousing Layout), mediating variable (Warehousing MIS) and the dependent variable (Warehouse Efficiency). The steps taken in analyzing the relationships of the variables are based on the recommendations of Baron and Kenny (1986). The results of the analysis are explained in the applications of multiple linear regressions formula ($Y = B_0 + B_1 X_1 + \ldots\ldots B_p X_p + \varepsilon$) (refer to **Table 4** and **Table 5**).

Table 4:
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.871(a)	.758	.753	.15465	.758	138.847	4	177	.000

a Predictors: (Constant), AMISC, AWOC, AHCMC, ALC
b Dependent Variable: AWEC

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Table 5:
Correlations Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1						
	(Constant)	.402	.039	.483	10.286	.000
	AWOC	.387	.045	.398	8.569	.000
	AHCMC	.010	.020	.024	.492	.623
	ALC	.122	.041	.161	2.999	.003
	AMISC					

a Dependent Variable: AWEC

Explanations:

AWE = 0.420 + 0.402AWOC + 0.387AHCMC + 0.010ALC + 0.122AMISC. All the coefficients are significance with $R^2 = 0.758$. Therefore there are 75.8 percent of total variations in AWE explained by AWOC, AHCMC, ALC and AMISC in maintaining the warehouse efficiency.

DISCUSSION

For variables AWOC, AHCMC, ALC and AMISC, the relationships are significance with the $R^2 = 0.758$ or 75.8 percent to explained in model AWE even though for ALC the significance coefficient is only 0.010. In this test, it is found that there are significance value of variables AWOC (0.00), AHCMC (0.00) and AMISC (0.00) but the value variable of ALC (0.623) is not significance. This reflects of non-significance role of ALC in maintaining the warehouse efficiency.

Hypotheses Testing

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

Based on **Table 5,** there is a strong relationship between WO and WE with its correlation coefficient 0.772. Based on *p*-value 0.00, 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 1 (b): There is a relationship between the Warehousing Operations (WO) and Warehousing MIS (WM).

Based on **Table 5**, there is a strong relationship between WO and WM with the significance correlation 0.375 and correlation coefficient based on *p*-value 0.00. 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 1 (c): There is a mediating effect of Warehousing MIS (WM) in the relationship between Warehousing Operations (WO) and Warehouse Efficiency (WE).

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). Step 4 the Sobel, Aroian and Goodman tests show the 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

Hypothesis 2 (a): There is a relationship between the Warehousing HCM (WH) and Warehouse Efficiency (WE).

Based on **Table 5,** there is a strong relationship between WH and WE with the correlation coefficient 0.744 and significant correlation based on *p*-value 0.00. These reflected strong significance relationships between these two variables in enhancing the warehouse efficiency activities with the implementation of warehousing HCM activities. Therefore, the study found that there is a relationship between the warehousing HCM and warehouse efficiency, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 2 (b): There is a relationship between the warehousing HCM (WH) and Warehousing MIS (WH).

Based on **Table 5,** there is a strong relationship between WH and WM with the correlation coefficient 0.405 and significant correlation based on *p*-value 0.00. These reflected very strong significance relationships between these two variables in enhancing the warehousing MIS activities with the implementation of warehousing HCM activities. Therefore, the study found that there is a relationship between the warehousing HCM and warehousing MIS, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 2 (c): There is a mediating effect of Warehousing MIS (WM) in the relationship between Warehousing HCM (WH) and Warehouse Efficiency (WE).

Step 1 results for the unstandardized regression coefficient (B=0.723) indicate the Warehousing HCM affects the Warehouse Efficiency significantly ($p<0.01$). Step 2 results of the unstandardized regression coefficient (B= 0.518) indicate the Warehousing HCM affects the Warehousing MIS significantly ($p<0.01$). Thus the requirement for mediation analysis in Step 2 as suggested by Baron and Kenny (1986) is completed. Step 3 results of the unstandardized regression coefficient associated with the relation between the Warehousing MIS and Warehouse Efficiency are significant (0.621, $p<0.01$). This regression equation also provides an estimate of the relation between the Warehousing HCM and the Warehouse Efficiency, controlling for the Warehousing MIS (B=0.198). Step 4 the Sobel, Aroian and Goodman tests show the results are significant, $p < 0.05$. This means the Warehousing MIS mediates the relationship between the Warehousing HCM and Warehouse Efficiency. Therefore, the study found that there is a mediating effect by Warehousing MIS in the relationship between Warehousing HCM and Warehousing Efficiency.

Hypothesis 3 (a): There is a relationship between the Warehousing Layout (WL) and Warehouse Efficiency (WE).

Based on **Table 5** there is a strong relationship between WL and WE with the correlation coefficient 0.240 and significant correlation based on *p*-value 0.01. These reflected significance relationships between these two variables in enhancing the warehouse efficiency activities with the implementation of warehousing layout activities. Therefore the study found that there is a relationship between the warehousing layout and warehouse efficiency, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 3 (b): There is a relationship between the Warehousing Layout (WL) and Warehousing MIS (WM).

Based on **Table 5** there is a strong relationship between WL and WM with the correlation coefficient 0.633 and significant correlation based on *p*-value 0.00. These reflected very significance relationships between these two variables in enhancing the warehousing MIS activities with the implementation of warehousing layout activities. Therefore, the study found that there is a relationship between the warehousing layout and warehousing MIS, which is a positive relationship in enhancing the warehouse efficiency.

Hypothesis 3 (c): There is a mediating effect of Warehousing MIS (WM) in the relationship between Warehousing Layout (WL) and Warehouse Efficiency (WE).

Step 1 results for the unstandardized regression coefficient (B=0.160) indicate the Warehousing Layout affects the Warehouse Efficiency significantly ($p<0.01$). Step 2 results of the unstandardized regression coefficient (B=0.347) indicates the Warehousing Layout 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 (0.062, $p<0.01$). This regression equation also provides an estimate of the relation between the Warehousing Layout and the Warehouse Efficiency, controlling for the Warehousing MIS (B=0.465). Step 4 the Sobel, Aroian and Goodman tests show the results are significant, $p < 0.05$. This means 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 Layout and Warehousing Efficiency.

CONCLUSIONS, CONTRIBUTIONS AND RECOMMENDATIONS

The results indicate the important of warehouse efficiency in the manufacturing firms. The warehouse operations, HCM, layout 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, Warehousing HCM and Warehousing Layout that mediate positively to its relationship over the Warehouse Efficiency. Thus this concludes that the manufacturing firm achievement is realistically depending on the warehouse performance in ensuring mainly good results of inventory accuracy and space optimization that reflects the firm operational process performance. 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 warehouse is 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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