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REVERSE LOGISTICS: PRESSURE FOR ADOPTION AND THE IMPACT ON FIRM'S PERFORMANCE

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ABSTRACT

One of the new challenges faced by Malaysian firms that want to go global is the fact that many countries have introduced legislation or directives to ensure effective disposal of manufactured products and its waste. Furthermore, the increase in awareness on environmental issues, sustainable development, corporate citizenship and the benefit of recycling had also placed more pressure on firms to adopt sustainable business initiatives such as a better reverse logistics strategy. Manufacturing firms however often focused on forward logistics and as a result, they tend to overlook at the importance of reverse logistics activities and its potential of improving the firm's performance. The objective of this study is to look at the current level of reverse logistics adoption among manufacturers in Malaysia and to identify the influence of customer/stakeholder pressure, regulatory pressure, financial and competitive pressure, and corporate citizenship pressure on the level of reverse logistics adoption. In addition, this study also aims to determine the relationship between reverse logistics adoption level and firm's performance. Data was collected through survey questionnaire, and the respondents consist of managers at manufacturing firms located in the Northern State of Malaysia and the Klang Valley. 101 samples were collected and data analysis was conducted using the Partial Least Square (PLS) regression analysis, through SmartPLS 2.0 software. Findings indicate that the level of reverse logistics adoption among Malaysia manufacturers is considerably low. Out of four independent variables, only the regulatory pressure has a significantly strong influence on the level of reverse logistics adoption, while customer and stakeholder pressure has a significant but moderate influence. No significant relationship was observed between the level of reverse logistics adoption and firm's performance.

Keywords: Logistics; Reverse Logistics; Supply Chain; Environmental Awareness; Corporate Social Responsibility.

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1. INTRODUCTION

Reverse logistics has been defined as the movement of product or materials in the opposite direction of the supply chain for the purpose of creating or recapturing value, or for proper disposal. It includes processing returned merchandise due to damage, seasonal inventory, restock, salvage recalls and excess inventory, as well as packaging and shipping materials from the end user or reseller. It also includes recycling programs, hazardous material programs, obsolete equipment disposition, and asset recovery (Rogers & Tibben-Lembke, 2001).

Manufacturing firms these days often focused on forward logistics and as a result, they tend to overlook at the importance of reverse logistics activities. Management usually was so concerned with the inbound movement of material and product to ensure that they can deliver it efficiently within the required time frame and at the right cost, through their supply chain. As a result, firms did not acknowledge the importance of having a centralized return centres (CRC) to process return product and there is also a temptation to redirect reverse logistics personnel to the forward logistics function when the facility is experiencing high demand (Rogers & Tibben-Lembke, 1998). In addition, reverse logistics should be properly managed just as forward logistics because it is also a cost centre to the company. Minahan (1998) estimated that reverse logistics activities constitute between 3 to 4% of a company's total logistics cost. On the other hand, some forward thinking companies in industries such as electronic equipment, household appliances, automotive parts, pharmaceuticals and chemicals view reverse logistics as a significant source of untapped profitability (Anderson, 2009; Jayaraman & Luo, 2007). Company such as Estee Lauder for example has, after a very successful reverse logistics project created $250 million product line from its return goods flow. Similarly, Caterpillar investment in remanufacturing plant in Mississippi that disassembles and rebuilds diesel engines pays off when the division has become their fastest growing unit with annual revenue tops $1 billion and is estimated to grow 20% a year (Jayaraman & Luo, 2007). These examples indicate that proper reverse logistics activities may help firm's improve the performance.

One of the new challenges faced by Malaysian firms that want to go global is the fact that many countries have introduced legislation or directives to ensure effective disposal of manufactured products and its waste. Furthermore, the increase in awareness on environmental issues and the benefit of recycling had also placed more pressure on firms to create a better reverse logistics strategy. As an example, this is evident in Europe where a new regulation with the objective to reduce the amount of waste dumped in landfills results in all manufacturers, wholesalers and retailers all came under the Waste Electrical and Electronic Equipment (WEEE) Directive in January 2007. Under the terms of the regulations, manufacturers had to join a WEEE compliance scheme by March 2007, and as of July 2007 had full financial responsibility for recycling household equipment. As a result, the ability to manage the reverse logistics process efficiently will definitely become one of the critical factors for manufacturers and retailers who currently doing business or those who are thinking of going into Europe during the next couple of years (Scott, 2008). Firms that comply with regulations and stress on environmental protection will have a good goodwill or corporate citizenship among their customers.

Another activity involved in firm's reverse logistics system besides managing product disposal is the management of after-sales service, which is also a part of customer relationship

management (CRM). A product is returned by a customer maybe because it is defective, did not work as advertised, in wrong size or perhaps because the customer suddenly changed minds and decided that they did not need the thing after all (Blanchard, 2007). Proper after-sales service may help to enhance customer's loyalty and at the same time might improve firm's competitive advantage. According to Gentry (1999), overall customers returns are estimated at 6% of sales and may run as high as 15% for mass merchandisers and up to 35% for catalogue and e-commerce retailers. However, most of the business organizations are not aware about the after-sales service factors and its impact towards the customer satisfaction. Failing to realize the importance of the factors can lead to a disastrous and threatening business relationship. Dissatisfied customers will turn to competitors who can offer better after-sales services (Shaharudin, Yusof, Elias & Mansor, 2009).

Besides regulation and customer, other stakeholders and even competitors are expected to also put more pressure on firms to improve the level of reverse logistics adoption as rivalry between firms in the global market these days put more pressure on companies to reduce costs. Getting ahead of the competitors in customer service will definitely improve the manufacturer's financial proficiency, through improves profits and higher recovery rates (Stock, 1992). Based on the above issues, it is obvious that Malaysian manufacturers these days faced pressures to implement reverse logistics adoption. Therefore, this study is conducted in order to determine which pressure has the most influence on the level of reverse logistics adoption. In addition, the other objective of this study is also to identify the current level of reverse logistics adoption among Malaysian manufacturers and most importantly, to study whether reverse logistics based on the manufacturers point of view has an influence on firm's performance or not.

2. REVERSE LOGISTICS ACTIVITIES

Reverse logistics activities offers benefits to the customers, companies and even the environment. There are various business activities that are part of reverse logistics programme. Each activities serve different purposes such as to remove defective and environmentally hazardous products from the hands of customers and this practice subsequently leads to benefits to the environment (Jayaraman, Patterson, & Rolland, 2003). At the same time, companies can become more environmentally efficient through activities such as recycling, reusing, and reducing the amount of materials used (Carter & Ellram, 1998; Aghazadeh, 2008). By reusing the end-of-life products, the environment is benefited and the company' goodwill among the consumer might increase. Reverse logistics might also lead to production of green products through recycling, remanufacturing or reconditioning that appeal the consumer, as present day consumers are ready to pay more for green products (Vandermerwe & Oliff, 1990). Jayaraman and Luo (2007) stresses that high quality reverse logistics activities can also promote long-term relationships where customers are more likely to repurchase from firms who do a good job at handling returns. Table 1 describes some of the major the activities involved in reverse logistics program.

Table 1: Reverse Logistics Activities and Its Description

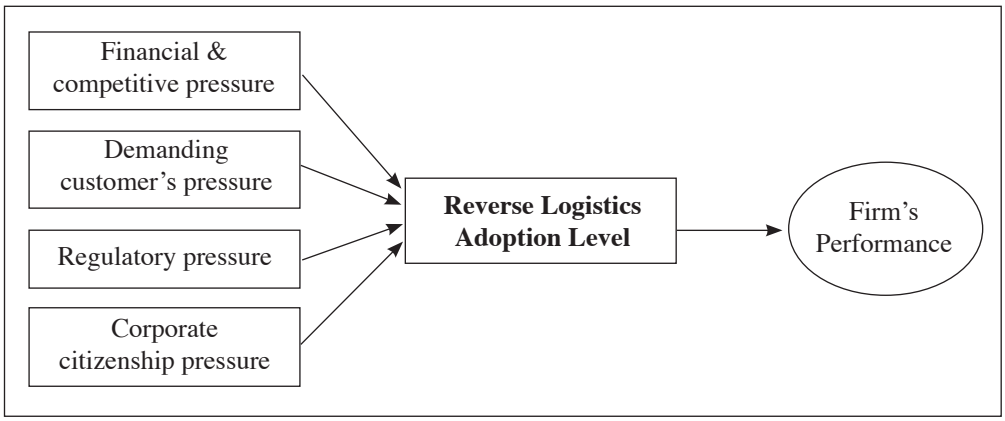
Activities	Description
Returns	Products for which a customer wants a refund because it either fails to meet his needs, the standard, or fails to perform.
Disposition	How a product is disposed. Either sold at an outlet, sold to broker, sent to landfill etc.
Green manufacturing	Attempts to minimize the ecological impact of manufacturing activities.
Reconditioning/ Refurbishing	When a product is cleaned and repaired to return it to "like new" state.
Recycle	When a product is reduced to its basics elements, which are reused.
Remanufacturing	Similar to refurbishing but require more extensive work; often requires completely disassembling the product.
Salvage	When a product is sold to a broker or some other low-revenue customer (Outlet/discount store).
Landfill	A controlled environment for burying solid waste

Reverse logistics activities offers benefits to both the customers, companies and even the environment. For example, reverse logistics activities involve the removal of defective and environmentally hazardous products from the hands of customers and this practice subsequently leads to benefits to the environment (Jayaraman, Patterson, & Rolland, 2003). For companies that continually strive for achieving cost savings in their production processes, reverse logistics program is a good option as it would lead to cost reduction (Fassoula, 2005; Gentry, 1999; "Competitive advantage through," 2004). At the same time, companies can become more environmentally efficient through recycling, reusing, and reducing the amount of materials used (Carter & Ellram, 1998; Aghazadeh, 2008). By reusing the end-of-life products the environment is benefited and the company' goodwill among the consumer might increase. Reverse logistics might also lead to production of green products that appeal the consumer as present day consumers are ready to pay more for green products (Casadesus-Masanell et al., 2009; Vandermerwe & Oliff, 1990). Jayaraman and Luo (2007) stresses that high quality reverse logistics can also promote long-term relationships where customers are more likely to repurchase from firms who do a good job at handling returns.

3. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Figure 1 presents the theoretical framework of the study. It is developed based on previous study related to reverse logistics adoption. The model consists of four independent variables namely financial and competitive pressure, customer/stakeholder pressure, regulatory pressure and corporate citizenship pressure. These four proposed factors are expected to directly impact the dependent variable, which is the level of reverse logistics adoption.

Figure 1: Theoretical Framework of the Study



3.1. Financial and Competitive Pressure

In order to be competitive, firms these days need to innovate and discover the best competitive opportunities and improve the quality of its products and methods in order to progress. At the same time, firms who want to sustain their competitive advantage must earn the trust of customers and this could be gained by having a good return policy. A good return policy needs good reverse logistics programme. The reality is that a good reverse logistics programme can be a differentiator and provides a means of gaining market and competitive advantage (Jayaraman & Luo, 2007). Rivalry between firms in the global market these days put more pressure on companies to reduce costs. Implementation of reverse logistics activities can help firms in becoming more proficient at handling returned goods. It will not only improve relationships along the supply chain, but also reduces costs. Thus, this proficiency improves profits and higher recovery rates are reached (Stock, 1992). Previous studies found out that there is a tendency that the intensity with which firms compete with their competitors in the market positively affects their strategic business policies, such as it influence manager's investment decisions (Grenadier, 2002), or in their innovation effort (Aghion et al., 2005), or in creating firm's marketing strategy (Porter, 1979). Therefore, it is hypothesises that:

> H_1: Financial and competitive pressure is positively related to the level of reverse logistics adoption.

3.2. Demanding customer/Stakeholders Pressure

In the present scenario where there is a growing concern for environmental protection among consumers and stakeholders such as the shareholders, government, non-governmental Organisations (NGOs) or other pressure groups; firms are expected to be under enormous pressure to implement reverse logistics. Customers even are ready to pay more for environmental-friendly products (Casadesus-Masanell et al., 2009; Vandermerwe & Oliff, 1990), so there are not many options left for companies but to go for reverse logistics practices. This requires proper disposal of end-of-life products which otherwise have a negative impact on the environment. This public concern for environment should not be taken as a problem, but must be considered as opportunities for companies to gain more profit by marketing their green products. Implementation of reverse logistics also requires a liberal return policy where customers are often allowed to return products for any reason. This coupled with the need to accommodate damaged or defective merchandise, product recalls, maintenance and repairs, means logistics professionals must place a higher priority on effectively managing returns (Autry, Daugherty, & Richey, 2001). Efficient after-sales services will definitely increase the consumers' satisfaction (Shaharudin et al., 2009). Based on the above argumentation, it is hypothesises that:

H_2: Demanding customer/stakeholders pressure is positively related to the level of reverse logistics adoption.

3.3. Regulatory Pressure

Sustainable development and environmental protection concerns are among the significant issues faced by businesses these days. Introduction of new or improved regulations that relates to product and waste disposal may make it mandatory for the companies to recover used products produced by them or accept them back at the end of the useful life of the product. Regulations are generally credited as having the greatest influence on a firm's reverse logistics activities (Carter & Ellram, 1998) and therefore, companies are expected to focus on reverse logistics operations because of environmental reasons (Rogers & Tibben-Lembke, 1998). European Waste electrical and electronic Equipment (WEEE) Directive introduced in January 2007 for example requires electrical and electronic manufacturers to comply with this scheme in order to trade in Europe (Scott, 2008). The German packaging ordinance of 1991 resulted in the companies working closely with their competitors to put tough environmental policies into practice (Cairncross, 1992). Packaging therefore was returned mainly because it is reusable or sometimes legal regulations required that it should be disposed of in a proper and acceptable manner (Rogers & Tibben-Lembke, 2001). Previous studies reveal that most firms who are practicing environmentally-friendly programs are doing so only because they are trying to avoid violating environmental-related regulations (Luken & Van Rompaey, 2008; Hokey & William 2001). As a result, the third hypothesis of this study is:

H_3: Regulatory pressure is positively related to the level of reverse logistics adoption.

3.4. Corporate Citizenship Pressure

Firms these days are also under huge pressure to behave in a socially responsible manner, or usually known as corporate citizenship pressure. Corporate citizenship is the extent to which businesses are socially responsible for meeting legal, ethical and economic responsibilities placed on them by shareholders. The aim is for businesses to create higher standards of living and quality of life in the communities in which they operate, while still preserving profitability for stakeholders. As demand for socially responsible corporations' increases, investors, consumers and employees are now more willing to use their individual power to punish companies that do not share their values. For example, investors who find out about a company's negative corporate citizenship practices could boycott its products or services, refuse to invest in its stock or speak out against that company among family and friends (Investopedia, 2012). Corporate citizenship is likely to be acknowledged by businesses as a worthwhile investment if its activities clearly trigger consumers' active support. Inasmuch as corporate citizenship may be desirable for society as a whole, it is unlikely to be widely embraced by organizations unless it yields concrete business benefits (Isabelle & Ferrell, 2001). Implementation of reverse logistics activities is a way to portray good corporate citizenship. Therefore, it is hypothesises that manufacturers will implement or increase the current level of reverse logistics adoption due the corporate citizenship pressure. Thus, the fourth hypothesis of this study is:

H_4: Corporate citizenship pressure is positively related to the level of reverse logistics adoption.

3.5. Firm's Performance

In measuring the firm's performance, it is essential to recognize the multidimensional nature of the performance construct (Cameron, 1978; Chakravarthy, 1986). Previous research testing the relationship between firm's strategy and performance suggested that it should include multiple performance measures. Such measures could include traditional accounting measures such as sales growth, market share, and profitability. Other non-financial considerations may also be used such as reputation, public image and goodwill, and the commitment and satisfaction of customers (Lumpkin & Dess, 1996).

Many benefits can be associated directly with effective reverse logistics management. These include, among others, improved customer satisfaction and reduction in inventory and warehousing cost. The benefits of effective reverse logistics management can also be considered as some of the key performance measures of reverse logistics program and these could include environmental regulatory compliance, improved customers relations, recovery of assets (products), cost containment, improved profitability and reduced inventory investment (Autry, et al., 2001). An effective reverse logistics system could potentially increase profitability via reduced material requirements and an improved market share via an environmental image. Indirect benefits of a reverse logistics programme such as better corporate image and increased levels of customer satisfaction may also add value (Jayaraman & Luo, 2007). Based on these arguments, the final hypothesis of this study is:

H_5: The level of reverse logistics adoption has a positive impact on firm's performance.

4. METHODOLOGY

This study is explanatory in nature as it tries to explain the causal relationship between four factors (financial and competitive pressure, customer and stakeholder pressure, regulatory pressure, and corporate citizenship pressure) with the level of reverse logistics adoption among manufacturers in Malaysia. It also tries to find out whether the level of reverse logistics implementation has a significant effect on firm's performance or not. In order to achieve the objective of the study, quantitative research approach was adopted where primary data were collected using survey questionnaires. Survey questionnaire was developed based on measures used in previous related studies to gain information on the level of pressure faced by the manufacturers, the current level of reverse logistics adoption and the level of performance. The population of this study consists of all manufacturing companies located at the three northern state of Malaysia, which are Penang, Kedah and Perlis, together with companies located in the Klang Valley, namely Kuala Lumpur and Selangor. Manufacturers were selected as respondents of this study because manufacturing sector is a major contributor to Malaysian economy. It accounts for 20.6% of Malaysia's gross domestic product (GDP) and is expected to be an important economic growth driver during the Tenth Malaysia Plan period which takes 2011 to 2015. The sector is expected to grow at 5.7% annually until 2015, raising its contribution to GDP to 26.3% by the end of the Plan period (Ministry of Finance Malaysia, 2012). The increase in manufacturing activities however brings a serious impact on Malaysian environmental quality. The Malaysia Environmental Quality Report (2011) indicates that manufacturing industries and are among the major sources of water and air pollution in this country. One possible solution in reducing the environmental pollution from manufacturing activities is through reverse logistics and thereby justifies the selection of manufacturers as the respondent for this study.

The sampling frame used for this study is the Federation of Malaysian Manufacturers (FMM) Directory for the year 2010. Manual count of the directory shows that there are 1356 manufacturers located in the above mentioned states from various industries but most numbers of manufacturers are from the electrical and electronics, automotive, chemicals and petroleum, food and beverage, and also machinery and fabricated metal industry. Manufacturers from various different industries were randomly selected to allow generalisation of the findings towards every manufacturing sector in Malaysia. Based on the sample size table developed by Cavana, Delahaye and Sekaran (2001), the number of sample needed for this study is 300. A simple random sampling method was adopted in selecting the respondent.

The survey questionnaire for this study have five different sections where the first section looks at the company's demographic information while second section obtain the reverse logistics activities and the level of reverse logistics implementation at the company. Third section consists of questions for all four independent variables of the study (reverse logistics pressures). Both the independent and dependent variables of this study was measured using five points Likert scale. Survey questionnaire was developed based on the instruments used in previous studies related to reverse logistics, firm's performance or other relevant topics. Before the actual distribution of questionnaires, a pilot study was conducted to determine the readers understanding of the items and to confirm the internal reliability. It is pertinent in

order to further improve the questionnaires and avoid any confusion on the part of respondents before the actual questionnaire distribution took place. In addition, pilot study is relevant as the feedback given by the respondents help improve the reliability of the research. First draft of the questionnaire, which combined the previous measures used in related research was pilot tested to confirm its internal reliability. A total of 30 companies were selected based on convenience basis for this pilot study. Data from pilot study were analyzed using SPSS and the reliability of each variable was checked using their Cronbach's Alpha value. Table 3.8 shows the result of pilot study data analysis where all variables of the study have a Cronbach's Alpha value of more than 0.6, which is the cut-off value or the acceptable reliability level. It also proofs that there is good internal consistency of the survey items in the scale. Several questions were also identified by respondents as being vague and quite confusing. The pilot study helped to identify this problem and thus been improved to ensure better understanding of the questions asked. All the necessary changes and amendments to the questionnaire based on the pilot study were conducted before the actual data collection activity was carried out.

In total, 500 survey questionnaires were distributed either via self-administered, regular mail or through email. Some questionnaires were also sent by faxes as per respondent's request. For mail survey, a mailed package that included a cover letter explaining the research objectives and instructions on how to complete the questionnaire, together with a postage-paid reply envelope, was sent to respondents in order to encourage the return of the questionnaire. All the necessary action was taken to ensure that those who filled in the survey via self-administered and through email were omitted from the mailing list. The questionnaire was sent to the key informant within the companies, namely the officer in-charge of supply chain and logistics operation or the top management of the company itself. A telephone follow up was made two weeks after the questionnaire was posted to remind the respondents about the questionnaire. Respondents were also promised anonymity for themselves and their company, in addition to a guarantee of the confidentiality of data they provided.

Table 2: Cronbach Alpha Value for Each Variable

Variables	Cronbach's Alpha
Financial/Competitors pressure	0.689
Customer and stakeholder pressure	0.719
Regulatory pressure	0.866
Corporate citizenship pressure	0.848
Reverse logistics level	0.817
Performance	0.849

Even with the above data collection efforts conducted to acquire more returned questionnaires, only 104 of the 500 surveys distributed to selected companies were completed and returned, which makes the return rate 20.8%. Upon preliminary screening of all the returned questionnaires, only 101 questionnaires are considered as usable for further data analysis. Three questionnaires were rejected because of too many missing value. Data analysis was conducted

using two statistical softwares, which were SPSS for descriptive statistics and SmartPLS 2.0 in order to test the relationship between the independent and dependent variables. The structural equation modelling technique using the Partial Least Square (PLS) regression approach was used to validate the measurement instrument and research model of this study because it examine the causal relationship between pressures that influence the level of reverse logistics adoption, followed by how the level of adoption impact firm's performance. At the same time, PLS also has the ability to model latent constructs under conditions of non-normality and small to medium sample sizes as it places minimal restrictions on measurement scales and residual distribution (Chin, Marcolin, & Newsted, 2003). PLS analysis involves two stages. The first one is the assessment of reliability and validity of the measurement model established. The objective is to make sure that the construct measures are valid and reliable before attempting to draw the conclusions (Hulland, 1999; Barclay, Higgins, & Thompson, 1995). During this stage, the convergent and discriminant validity of the research instrument was tested based on indicator's factor loading, and the average variance extracted (AVE) value. The second stage is the assessment of the structural model itself and a bootstrap re-sampling procedure with 500 samples was used to calculate the significance of path coefficients in the research model. The bootstrap approach treats the collected research sample as a population from which a large number of samples are drawn with continuous replacement such that the probability of selection for any given case remains equal over every random draw (Mallinckrodt, Abraham, Wei & Russell, 2006).

5. RESULTS

5.1. Descriptive analysis

Preliminary analysis of the returned questionnaires shows that majority of the respondents are from the electrical and electronics industry (64%), automotive industry (27%), food and beverage (5%) and others (4%). Out of 101 manufacturers that return the survey questionnaires, 43 companies are fully owned by a foreign company or 42.6%, while 33 firms or 32.7% are a local company with no foreign shares at all. Another 10 (9.9%) and 12 (11.9%) have foreign ownership of 1 to 50% and 52 to 99% respectively. 31 companies have been in operation for more than 25 years or 30.7%. Second is in between 6 to 10 years with 28 (27.7%) companies and third is 16 to 20 years with 24 (23.8%) companies. Majority of respondents have more than 301 employees, as a total of 64 manufacturers are in this category while 42 of them employ more than 500 employees. 37 manufacturers in total have less than 300 employees and 23 employs less than 100 people. In terms of annual turnover, more than half earn more than RM20 million annually or over 62% of the respondents. Even 55 of them earned more than RM40 million a year. Another 37 manufacturers earned less than RM20 million where 4 earned less than a million in revenue.

In order to measure the level of reverse logistics adoption, four measures were used, namely the financial investment, resource allocation, management commitment and overall involvement towards reverse logistics activities. Three out of these four indicators as depicted in table 2 scores a mean value of less than 3.0 (average), which is financial investment, resource allocation and overall involvement. Only mean scores for management commitment is more than the average, which is 3.12. Overall mean for reverse logistics level is 2.67.

Table 3: Level of Reverse Logistics Adoption

	N	Mean	Std. Deviation
Financial investment in RL	100	2.36	1.168
Resources allocated for RL	100	2.35	1.104
Mgmt Commitment in RL	100	3.12	1.249
Overall involvement in RL	101	2.74	1.180

5.2. Measurement Model

The assessment of the measurement model is done by examining the content validity, convergent validity and discriminant validity. For content validity, all scales used in this study were derived from previous studies related to reverse logistics and business performance. A first draft of the questionnaire was discussed with a few lecturers before it was pilot tested at 30 manufacturing companies. The Cronbach Alpha for each variable is above the cut-off level 0f 0.6. Therefore, content validity is assumed to be fulfilled in this study. According to Fornell and Larcker (1981), convergent validity is demonstrated when indicators load highly (loading> 0.50) on their associated factors. Table 4 shows the items loading for every variables of the study. There are three items that have loading scores less than 0.5, which are CorpCitz2, CustSH6 and Fincom1. These items therefore are removed and will not be used in the assessment of the structural model analysis. Besides looking at items loading, convergent validity is also consider as adequate when each constructs (variables) have an Average Variance Extracted (AVE) score of at least 0.5 (Fornell & Larcker, 1981). Table 4 also shows that all constructs have an AVE value of more than 0.5 and therefore, it can be concluded that the model has an adequate convergent validity.

Discriminant validity describes the degree to which the operationalisation is not similar to other operationalisations that it theoretically should not be similar to. Campbell and Fiske (1959) introduced the concept of discriminant validity within their discussion on evaluating test validity. A successful evaluation of discriminant validity shows that a test of a concept is not highly correlated with other tests designed to measure theoretically different concepts. The AVE statistics are then again used to determine the discriminant validity of the model. The square root of the average variance extracted (AVE) statistics were calculated using Microsoft Excel and compared with the correlations among the latent variables using the latent variable correlation matrix output of PLS (Chin, et al., 2003). The latent variable correlation matrix and the square root of the AVE are indicated in Table 5.Correlations between constructs is displayed in the lower left off-diagonal elements in the matrix.

Average variance shared between the construct and its measures should be greater than the variance shared between the construct and other constructs in the model (Fornell & Larcker, 1981). Table 5 shows that the diagonal elements in bold (square root of AVE) are greater than the off-diagonal elements at both corresponding rows and columns. For example, the square root of AVE for CorpCitz (0.778) is higher than the correlation of CustomerSH and CorpCitz (0.196). It is also higher than corporate citizenship's correlation with other constructs

(FinCom = 0.343, performance = 0.154, RL_Level = 0.121, RegPres = 0.331). Therefore, it can be concluded that the findings of the PLS measurement model analysis show evidence of discriminant validity, where all constructs are statistically discriminated from the others.

5.3. Structural Model

The second step after the assessment of the measurement model is the assessment of the structural model itself by looking at the sign and magnitude of path coefficients. It is then followed by the test of whether the paths are statistically significant. The bootstrap procedure with 500 re-samples as recommended by Chin, Marcolin and Newsted (2003) was used to calculate the significance of the path coefficients (*t*-value). The bootstrapping procedure generates random samples of observations from the original data set by using a sampling through replacement technique. The path coefficients were then re-estimated using each one of these random samples of observations. Previous studies using PLS have typically considered path coefficient of above 0.20 as having a strong relationship, path coefficients of between 0.10 to 0.20 as moderate, and path coefficients below 0.10 as weak (Johnson, 1997). Meanwhile, the degree to which the PLS model accomplishes its objectives of minimising errors or to maximise the variance explained, can be determined by examining the R^2 values (Lertwongsatien, 2000). R^2 is a measure of the proportion of the total of the dependent variables, which is explained by independent variables. Falk (2005)suggests that the R^2 value should be more than 0.1, as any value lower than that informs very little even though it is statistically significant. The entire specified path and their coefficient, together with the R^2 value is shown in figure 2.

Table 4: Survey Items Loadings

Indicators	Loadings	Composite Reliability	Average Variance Extracted (AVE)
Corporate Citizenship		0.882894	0.604626
CorpCitz1	0.679568		
CorpCitz2	**0.253059**		
CorpCitz3	0.939790		
CorpCitz4	0.687659		
CorpCitz5	0.788954		
CorpCitz6	0.732401		
Regulatory Pressure		0.863320	0.517393
RegPres1	0.566921		
RegPres2	0.701919		
RegPres3	0.640475		
RegPres4	0.880858		
RegPres5	0.745940		
RegPres6	0.737827		

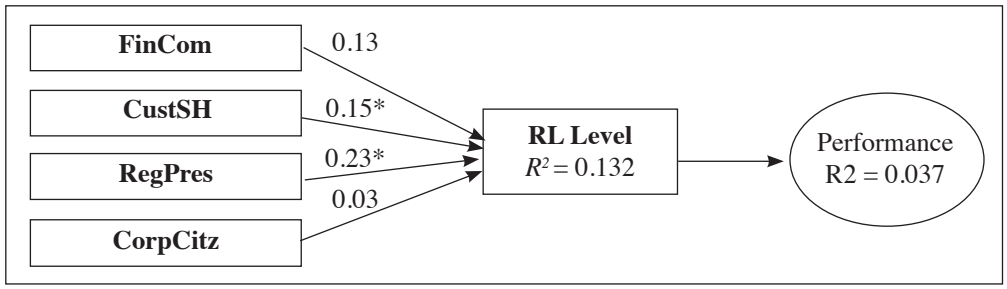
Table 4: Survey Items Loadings *(cont)*

Indicators	Loadings	Composite Reliability	Average Variance Extracted (AVE)
Customer/Stakeholder Pressure		0.792424	0.542479
CustSH1	0.740709		
CustSH2	0.855973		
CustSH3	0.556716		
CustSH4	0.514983		
CustH5	0.500000		
CustSH6	**-0.075948**		
Reverse logistics Level		0.914318	0.728479
RLlevel_Fin	0.853587		
RLlevel_Invnt	0.903515		
RLlevel_Mgmt	0.744255		
RLlevel_Res	0.903126		
Financial and Competitive Pressure		0.796689	0.542880
FinCom1	**0.397222**		
FinCom2	0.554491		
FinCom3	0.678030		
FinCom4	0.730651		
FinCom5	0.720458		
FinCom6	0.620325		
Firm's Performance		0.878022	0.510881
Performance1	0.785211		
Performance2	0.594126		
Performance3	0.573672		
Performance4	0.823094		
Performance5	0.755454		
Performance6	0.677491		
Performance7	0.755143		

Table 5: Latent Variable Correlation Matrix

	CorpCitz	CustomerSH	FinCom	Performance	RL_Level	RegPres
CorpCitz	**0.778**					
CustSH	0.196	**0.737**				
FinCom	0.343	0.343	**0.737**			
Performance	0.154	0.110	0.216	**0.715**		
RL_Level	0.121	0.240	0.246	0.191	**0.853**	
RegPres	0.331	0.215	0.324	0.109	0.293	**0.720**

Figure 2: Structural Model Result of the Analysis



Note: Significant at p < 0.05.

Table 6 then summarise the outcome of PLS model analysis using Bootstrapping Procedure and it details out the path coefficients, their t-values and the level of significance for each of them. The T-distribution table were referred in order to obtain the *P* value (Degree of freedom, df = 100). The result shows that out of 5 relationships tested, only 2 shows a significant relationship, which are between customer and stakeholder pressure (CustomerSH) with the level of reverse logistics adoption (RL_Level) and between corporate citizenship (CorpCitz) and the level of reverse logistics adoption (RL_Level). Even the relationship between the level of reverse logistics adoption and firm's performance did not show a significant relationship. Path coefficient for regulatory pressure is 0.23, indicating a strong relationship with level of reverse logistics adoption while Customer/stakeholder pressure only have a moderate relationship with adoption, which is 0.15.The variance explained values (R^2) for level of reverse logistics adoption is 0.132. It means that the model explains 13.2% of the variance in the level of reverse logistics adoption among manufacturers in Malaysia. For performance, the variance explained values is only 0.037 or 3.7%. This is very low and it justify why the bootstrap analysis before shows that the relationship between level of reverse logistics adoption and firm's performance is not significant.

Table 6: Outcome of Structural Model Analysis

	Sign	Path	T-Value	*P*-Value	Sig
FinCom➔RL_Level	+	0.13	0.924	0.1789	No
CustSH➔RL_Level	+	0.15	1.682	0.0478	Yes
RegPres➔RL_Level	+	0.23	1.760	0.0407	Yes
CorpCitz➔RL_Level	-	0.03	0.138	0.4453	No
RL_Level➔ Performance	+	0.19	1.401	0.0822	No

Note: Significant, $p < 0.05$

6. DISCUSSIONSAND CONCLUSIONS

The first objective of this study were to empirically study the level of reverse logistics adoption and the impact of financial and competitive pressure, customer and stakeholder pressure, regulatory pressure and corporate citizenship pressure on reverse logistics adoption

level among manufacturing firms in Malaysia. Another objective is to study the manager's perception on whether reverse logistics have influence on firm's performance or not. The analysis of data has led to some major findings. First, the level of reverse logistics adoption among Malaysian manufacturers is considerably low with a mean score of 2.67. An item by item analysis shows that the level of investment, resources and overall commitment towards reverse logistics are less than average. It shows that firms are not really ready to commit themselves towards investing and allocating extra resources for reverse logistics adoption. Even the score for commitment by the management shows just a slightly higher than average score. It seems that manufacturers are not ready to invest and allocate resources even though the management of the company is aware of the benefit of adopting reverse logistics.

Second, only two out of four studied variables have a significant relationship with reverse logistics adoption level, namely regulatory pressure and, customer and stakeholder pressure. It is interesting to note that the reverse logistics adoption based on this study is affected strongly by rules and regulation, while demanding customer and stakeholder have a moderate influence. The results demonstrated that the government, consumer and pressure groups such as NGOs have a strong influence on firm's decision and their voice would lead to an increase in the likelihood of adopting reverse logistics or increasing the current level of reverse logistics activities among manufacturing firms in Malaysia. Financial and competitive pressure and corporate citizenship pressure have no significant impact on reverse logistics adoption. Financial and competitive pressure might not have a significant effect as firm's competitors might also do not heavily involve in reverse logistics activities. Therefore, there is no urgency for the respondent's to increase their involvement in reverse logistics activities.

Corporate citizenship meanwhile is important to manufacturers that produce consumer goods such as food and beverages, cosmetics, cars, but not for producers of industrial product, materials or components. Possibly, most respondents of this study did not manufactured consumer goods and that is why corporate citizenship does not significantly pressure firms to increase the level of their reverse logistics activities. Some authors do argue that reverse logistics performance could be poor due to the fact that more than one company may get involved in the reverse logistics process, and thus a holistic approach is required. Another reason behind this is that reverse logistics is still in its infancy and manufacturing organizations have not assumed a pro-active role to consider reverse logistics activities in the design phase (Carter & Ellram, 1998). Additionally, an efficient reverse logistics system is much more valuable to a company selling high-volume, high value product with a short life-cycle than to a retailer selling low-value products (Jayaraman & Luo, 2007).

Third, the results also indirectly indicate that the level of environmental awareness among consumers and stakeholders in Malaysia have improve significantly, that it influences firms decision in adopting the environmental friendly logistics practices such as reverse logistics. This is evidence when one of the item in the survey questionnaire which is *"Our customer and shareholder are concern about environmental protection and sustainable development" s*cores a mean of 4.07. It shows that managers involved in this study are generally agreed to the fact that the environmental awareness among the customer and stakeholder these days has increase. This phenomenon also put managers under a greater pressure to undertake reverse logistics not only as a consequence of their ethical principles but also because they feel that it is a good

way of satisfying their customers and stakeholders. Finally, this study examines the impact of reverse logistics adoption level on firms' performance, as perceived by the respondents. The output of data analysis stage shows that there is no significant relationship between the level of reverse logistics adoption and performance. This finding indicates that reverse logistics programs according to the managers of manufacturing firms in Malaysia did not contributes towards the improvement in firm's performance. Even the whole model of this study according to the PLS analysis explains only 3.7% of the variance in firms' performance, which is very low. It means that there are many other factors that determine the level of performance in the opinion of Malaysian manufacturers besides the adoption of reverse logistics.

The possible explanation for this finding may be related back to the previous discussions where regulatory pressure, together with consumer and stakeholder pressure have a significant influence on reverse logistics adoption level. The fact that reverse logistics adoption level have no influence on performance is observed possibly because there is lack of 'true' commitment by these manufacturers in implementing reverse logistics. They implement it not as part of their business strategy in order to improve the level of customer service, to improve quality, to increase their revenue, to provide environmental protection or to reduce costs but merely in response to the external pressures. Furthermore, just like many other logistics and supply chain strategy such as information technology adoption or any other management technique implementation, performance outcomes related to reverse logistics programs may remain sub-par without appropriate resource commitment (Skinner, Bryant, & Richey, 2008). Reverse logistics activities such as recycling, refurbishing, remanufacturing and repackaging require a significant resources commitment if the company want to reclaim the value from product returns. The level of resources allocated for reverse logistics activities by these manufacturers are also less than average, where the mean score for this item as shown in table 2 before, is only 2.35. Therefore, it is assumed to be among the reason why reverse logistics according to this study did not contribute much towards the performance of the company. Although previously highlighted literatures do state that reverse logistics helps improve firm's performance, there is also a similar study that shows disagree with result and similar to this study. A survey conducted by Eyefortransport (2012) for example reveals that high-tech manufacturing companies were split between seeing their reverse logistics as just cost centers to support product sales and as competitive differentiators. Only about 5% out of 200 companies involved in the study were able to apply these services in their profit centers, suggesting that only some high-tech manufacturing companies are able to generate revenue through reverse logistics. This finding indicates that majority of the respondents did not see reverse logistics as a source of revenue that consequently will improve firm's performance.

7. CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH

There are a number of significant contributions of this study to both the academia and business practitioners. Reverse logistics despite all the practical uses by many manufacturers in developed countries are still not a popular practice among Malaysian manufacturers. The main factors that results in adoption of reverse logistics and barriers that create this low adoption level are seldom explored within the available literature. Therefore, the results of this study fulfil this gap in the literature by answering the research questions of which factors increase the level of adoption and which barriers contributes to totally non or minimum level of adoption of

reverse logistics activities only. Regulatory pressure, together with customer and stakeholder pressure are found to have a significant relationship with the level of reverse logistics adoption. Issues such as lack of awareness and knowledge of reverse logistics, implementation cost is high, lack of resources and no management commitment is among the top barriers that inhibit an effective reverse logistics activities implementation among the manufacturers. At the same time, this study also contributes to the literature by providing some insights on the impact of reverse logistics adoption on firm's performance. Even though the finding is not as hypothesized, it shed lights on Malaysian manufacturers view on the factors that determine their business performance. The fact that reverse logistics is not considered as a contributors towards firm's performance means that Malaysian manufacturers are still behind if compared to manufacturers in developed countries who treats reverse logistics as anew source of core competency. According to Rogers, Lembke and Benardino (2013), managers should now broadened their perspective as the difference between a product's success (and profitability) and failure in today's competitive environment depends on how the end of life is managed. Finally, this study contributes to the literature on reverse logistics adoption specifically within the context of developing countries like Malaysia. Most studies on reverse logistics adoption to date have been conducted in developed countries such as the United States, United Kingdom, Australia and Europe.

For the practitioners, findings of this study could provide the management of a company especially a manufacturer with a better understanding on reverse logistics adoption, especially the factors that influence the adoption. Those who never know on the activities related to reverse logistics will have a better understanding about the concept. Manufacturing firms in particular, would be able to address their main concerns by looking at the findings of this study before they decide to proceed with the adoption of reverse logistics programmes. Findings and the discussions of this study could also serve as a guide for business managers or policy makers in Malaysia when creating policies related to reverse logistics, sustainable development or even environmental protection. This study clearly shows that strict regulation and strong pressure from customer and the stakeholders can increase the environmental awareness of managers and the tendency to implement reverse logistics among the manufacturers. This study also found out that managers involved did not view reverse logistics as a mean to improve their business performance, as there is no significant relationship evidence. Product returns and reverse logistics activities always been viewed as a cost centre by manufacturers and not as a source of competitive advantage. Therefore, less attention and resource allocation is given on reverse logistics activities. In contrast, manufacturers in developed countries as discussed in the literature review before have already reap the advantage of implementing reverse logistics such as reduction in logistics costs, increase profit, better environmental regulation compliance and improve in goodwill. Therefore, more efforts should be taken by the relevant government agencies, training centres and educational institutions to enlighten Malaysian manufacturing firm's managers on the potential of adopting comprehensive reverse logistics activities.

There are a few issues that arise from this study which could provide an opportunity for further research. First, data collected for this study is small due to cost and time constraint. The sample size of this survey is only 101 manufacturers. Another research with a greater sample size to replicate this survey using a different sample of companies in the other sectors such as service

sector may be conducted to validate these findings. Moreover, this study did not categorized the sample based on their level of adoption such as high reverse logistics adoption level, low level adopters and also non-adopters to refine and test the model. This will probably contributes to the variation of reverse logistics adoption in various industries. Finally, this study includes all manufacturing industries from all sizes and industry. The replication of the study where the analysis is conducted based on specific industry or sizes of the company would provide new insights into the reverse logistics adoption factors. It would also be interesting to replicate the study for the analysis of small and medium enterprises (SMEs) as the influential factors could be different from big enterprises and multinational companies.

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