The Pressure for Reverse Logistics Adoption among Manufacturers in Malaysia

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ABSTRACT

This study aims to examine how the level of reverse logistics adoption among manufacturers in Malaysia can be influenced by customer/stakeholder pressure, regulatory pressure, financial and competitive pressure, and corporate citizenship pressure. Data were collected through a survey questionnaire, and respondents were managers of manufacturing firms located in the Northern States of Peninsular Malaysia and the Klang Valley. Partial Least Square (PLS) regression analysis was applied and the findings indicate that regulatory pressure has a significantly strong influence on the level of reverse logistics adoption, while customer/stakeholder pressure has moderate influence.

Keywords: Corporate Social Responsibility (CSR), Environmental Protection, Reverse Logistics, Supply Chain Management
JEL Classification: M11, M14, M38

1. Introduction

Reverse logistics refers to the movement of products or materials that occurs in the opposite direction of the supply chain for the purpose of creating or recapturing value, or for the proper disposal of products or material. Manufacturing firms often focus on forward logistics and as a result, tend to overlook the importance of reverse logistics activities. The managements of firms are usually concerned with the inbound movement of material and product so as to ensure that these

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can be delivered efficiently within the required time frame and at the right cost, through the supply chain. Consequently, the importance of having a centralised return centre (CRC) to process returned products are overlooked by firms. Instead, they wrestle with the temptation to deploy reverse logistics personnel to the forward logistics function when the facility experiences high demand (Rogers & Tibben-Lembke, 1998).

Reverse logistics should be properly managed. Minahan (1998) estimates that reverse logistics activities constitute between 3 to 4 per cent of a firm's total logistics costs but some forward thinking firms 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). Estee Lauder, for example, has, after a very successful reverse logistics project, created a USD250 million product line from its returned goods flow. Similarly, Caterpillar's investment in a re-manufacturing plant in Mississippi that disassembles and rebuilds diesel engines pays off when the division becomes its fastest growing unit with an annual revenue of USD1 billion and it is estimated to grow at the rate of 20 per cent per year (Jayaraman & Luo, 2007).

Firms in Malaysia currently feel the pressure to introduce reverse logistics into their operations. One of the new challenges faced by the Malaysian firms that want to go global is the requirement to comply with legislations or directives introduced by foreign countries that can ensure the effective disposal of manufactured products and waste. For example, in Europe there is a regulation with the objective to reduce the amount of waste dumped in landfills. All manufacturers, wholesalers and retailers have to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive 2007. Under the terms of the regulations, manufacturers had to join a WEEE compliance scheme by March 2007, and by July 2007 to have full financial responsibility for recycling household equipment. Due to this, their ability to manage the reverse logistics process efficiently will definitely become a critical factor especially for manufacturers and retailers currently doing business or those intending to venture into Europe (Scott, 2008).

Reverse logistics is also seen to have strategic importance in alleviating environmental problems and generating economic benefits for firms and is therefore, a major issue of concern (Eltayeb & Zailani, 2011). The increase in awareness on environmental issues and the benefits of recycling have also placed more pressure on firms to create a better reverse logistics strategy. Understandably, firms that comply with regulations and stress on environmental protection will enjoy goodwill or corporate citizenship with their customers.

Besides managing product disposal, another activity linked to a firm's reverse logistics system is the management of after-sales service, which is also part of customer relationship management (CRM). A product may be returned by a customer for several reasons: it is defective, it is not as advertised, it is in the wrong size or perhaps because the customer had changed his/her mind and had decided that the product is no longer needed after all (Blanchard, 2007). Proper after-sales service may help to enhance a customer's loyalty and at the same time improve the firm's competitive advantage. According to Gentry (1999), the overall customers' returns are estimated at 6 per cent of sales and may be as high as 15 per cent for mass merchandisers and 35 per cent for catalogue and e-commerce retailers. However, most business organisations are not aware of after-sales service factors and the impact they have on customer satisfaction. Failure to realise the importance of these factors can lead to a disastrous and threatening business relationship. Dissatisfied customers will turn to competitors who can offer better after-sales services (Shaharudin, Md. Yusof, Elias, & Wan Mansor, 2009).

Thus, it is important for Malaysian manufacturers to realise the importance of reverse logistics and to implement it into their operations. Empirical studies investigating the existence of green supply chain initiative are limited, particularly those which focus on reverse logistics efforts. A study by Rao (2002), for example, had looked at 52 companies based in five countries, namely Philippines, Indonesia, Malaysia, Thailand and Singapore and this made it difficult to draw valid conclusions which can apply to Malaysia (Eltayeb, Zailani, & Jayaraman, 2010). In this regard, the current study is conducted in order to determine which factor has the most influence on the level of reverse logistics adoption in Malaysia. The objective of this study is to locate the impact of financial and competitive pressure, customer/stakeholder pressure, regulatory pressure and corporate citizenship pressure on the level of reverse logistics adoption among manufacturing firms in Malaysia.

This paper is outlined as follows. First, the paper starts with a brief outline of reverse logistics followed by the development of the theoretical framework and hypotheses. Next, it describes the research method employed to test the hypotheses. The subsequent section examines the findings and discusses the results. This paper concludes by looking at the contributions and limitations of this study, as well as suggestions for future research.

2. Reverse Logistics

Reverse logistics is defined as the movement of products or materials occurring 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 received from the end user or reseller. It also includes recycling programmes, hazardous material programmes, obsolete equipment disposition, and asset recovery (Rogers & Tibben-Lembke, 2001). Rejected items may be returned to the vendor, resold as it is, reconditioned to discount store or to a broker, or donated for charity (thereby earning some tax deduction[1]). If the item is not usable anymore, it may end up in a landfill or recycled. The descriptions of each reverse logistics activities are shown in Table 1.

Table 1:   Reverse Logistics Activities and Its Description

Activities	Description
Returns	A product for which a customer wants a refund because it either fails to meet his/her 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 minimise 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 then makes it reuseable.
Remanufacturing	Similar to refurbishing but requires more extensive work; often requires complete disassemblement of the product.
Salvage	When a product is sold to a broker or some other low-revenue customer (Discount store/outlet).
Landfill	A controlled environment for burying solid waste

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[1] Under section 34(6)(g) of the Malaysia Income Tax Act 1967, firms may earn tax deductions by donating the cash income resulting from the reverse logistics activities to approved institutions. Such deductions are restricted to 10 per cent of the aggregate income of the company.

Reverse logistics brings forth benefits such as cost reduction to customers and companies (Fassoula, 2005; Gentry, 1999). Further, reverse logistics removes defective and environmentally hazardous products from consumers through recycling, reusing and reducing the amount of materials used (Carter & Ellram, 1998; Aghazadeh, 2008), and this causes firms to become more environmental efficient. In their study, Olorunniwo and Li (2010) demonstrate that if a firm plans its reverse logistics effectively, a domino effect will likely be felt in its other operational activities as operational attributes tend to support each other where an improvement in one will lead to improvement in others. This finding is supported by Bernon, Rossi, and Cullen (2011) who iterate that the management of returns processes is important in minimising logistics costs and improving the re-sale revenue of products. Jayaraman and Luo (2007) further stress that high quality reverse logistics can also promote long-term relationships where customers are more likely to repurchase from firms that are effective and efficient in handling returns.

3. Theoretical Framework and Hypotheses Development

Figure 1 presents the theoretical framework of the study. This framework uses the foundation of the institutional theory as its main basis in providing a viewpoint on the adoption of strategies in managing operations and supply chains (Kauppi, 2013). According to the institutional theory, business practices are implemented so as to enhance the legitimacy of the organisations (DiMaggio & Powell, 1983). The institutional theory examines the cause of isomorphism factors that
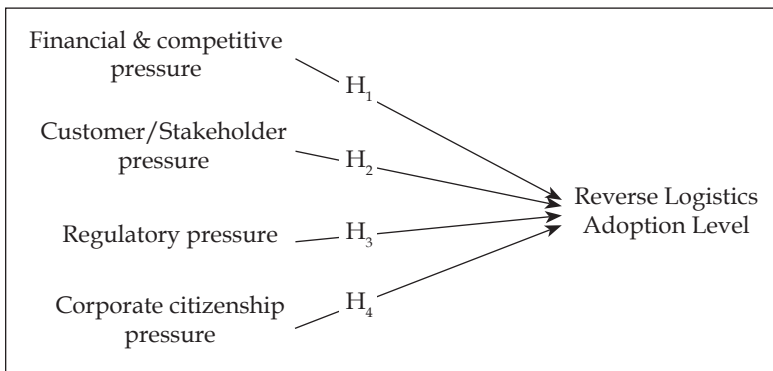

Figure 1:   Theoretical Framework

lead organisations to adopt similar structures, strategies and processes (Deephouse, 1996). There are two main variants to this theory: economic (Haunschild & Miner, 1997) and sociological (DiMaggio & Powell, 1983). This study adopts the sociological variant where the key tenet is that organisational isomorphism increases organisation legitimacy. Organisation legitimacy is defined as a generalised perception that treats actions of an organisation as desirable, proper and appropriate within some socially constructed systems (Suchman, 1995). It is also viewed as a necessary condition to compete, thereby driving organisations to adopt processes that lead to isomorphism (Gopal & Gao, 2009).

DiMaggio and Powell (1983) identify three types of mechanisms leading towards institutional isomorphism: coercive, mimetic and normative. Coercive isomorphism is found to be the most relevant to explain the phenomenon in the current study. According to DiMaggio and Powell (1983), coercive isomorphism occurs due to pressures, whether formal or informal, exerted on an organisation by other organisations which it is dependent on and also by the expectations of society. An organisation is under the pressure of its stakeholders, such as its customers and the government, to include social, environmental and economic responsibility considerations into its operations so that it will be perceived as being more legitimate (Zhu & Sarkis, 2007; Tate, Ellram, & Kirchoff, 2010; Sarkis, Zhu, & Lai, 2011). Miemczyk (2008), however, iterates that although coercive pressures can lead to the adaptation of practices, it does not always lead to efficiency.

The current study's model consists of four independent variables, namely financial and competitive pressure; customer/stakeholder pressure; regulatory pressure; and corporate citizenship pressure. These proposed factors are expected to directly impact the dependent variable, which is the level of reverse logistics adoption. The basis for this assumption comes from the coercive isomorphism mechanism stated in the institutional theory which posits that formal and informal pressures exerted by organisations or society can influence the management practice (Scott, 1987). This is further supported by findings from previous studies examining reverse logistics adoption pressures such as those done by Eltayeb and Zailani (2011) and Eltayeb, Zailani, and Jayaraman (2010).

3.1 Financial and Competitive Pressure

In order to be competitive, firms need to innovate and discover the best competitive opportunities and to improve the quality of its products

and methods in order to progress. At the same time, firms which want to sustain their competitive advantage must earn the trust of customers and this may be gained by having a good return policy. A good return policy requires a good reverse logistics programme. The reality is that a good reverse logistics programme can be a differentiator and it provides a way for firms to gain a competitive market advantage (Jayaraman & Luo, 2007). Competition between firms in the global market can put more pressure on firms to reduce costs. Thus, the implementation of reverse logistics activities can enable firms to become more proficient in handling returned goods. This not only improves inter-firm relationships along the supply chain, but also reduces costs. Hence, a good reverse logistics programme can improve profits and increase recovery rates (Stock, 1992). Previous studies find that there is a tendency which shows that the intensity with which firms compete with their competitors in the market positively affects their strategic business policies, such as influencing their investment decisions (Grenadier, 2002), increasing their innovation effort (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005), and shaping their marketing strategy (Porter, 1979). Due to this, it is hypothesised that:

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

3.2 Demanding Customer/Stakeholders Pressure

Currently, there is a growing concern for environmental protection. Thus, firms are expected to be under enormous pressure imposed by their customers and stakeholders such as their shareholders, the government, non-governmental organisations (NGOs) or other pressure groups, to implement reverse logistics. Since customers are prepared to pay more for environmental-friendly products (Casadesus-Masanell, Crooke, Reinhardt, & Vasishth, 2009; Vandermerwe & Oliff, 1990), a firm is forced to adopt the best reverse logistics practices for fear of losing its market share. One of the best practices to adopt is the proper disposal of end-of-life products which otherwise, may cause a negative impact on the environment. Public concern for environment should not be viewed as a problem, but instead be considered as an opportunity for firms to gain more profit by marketing their green products. The implementation of reverse logistics also requires a liberal return policy where customers are allowed to return products for any reason. It

may also include policies involving the replacement of damaged or defective merchandise, the recall of products and the provision of maintenance and repairs. Consequently, logistics professionals must give priority to the effective management of returns (Autry, Daugherty, & Richey, 2001) as efficient after-sales services will increase customer satisfaction (Shaharudin et al., 2009). Based on the above arguments, it is hypothesised 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. Regulations on products and waste disposal may be introduced to mandate firms to recover their used products or accept them back at the end of the products' useful life. Regulations are generally credited as having the greatest influence on a firm's reverse logistics activities (Carter & Ellram, 1998) and so firms are expected to focus on reverse logistics operations due to regulatory and environmental reasons (Rogers & Tibben-Lembke, 1998). The European Waste Electrical and Electronic Equipment (WEEE) Directive that was introduced in January 2007, for example, requires electrical and electronic manufacturers to comply with this scheme in order to trade in Europe (Scott, 2008). Another example is the German Packaging Ordinance of 1991 which resulted in companies working closely with their competitors so as to put tough environmental policies into practice (Cairncross, 1992). Packaging is returned mainly because it is reusable. Sometimes, there are regulations that require the packaging to be disposed in a proper and acceptable manner (Rogers & Tibben-Lembke, 2001).

In Malaysia, manufacturers have to adhere to the Malaysian Environmental Quality Act 1974. According to its preamble, the Act relates to the prevention, abatement, control of pollution and enhancement of the environment. Under this Act, a manufacturer is required to obtain approvals from the Director-General of Environmental Quality and to ensure the implementation of proper waste disposal activities before it is allowed to construct its premises. In addition, the Environmental Quality (Sewage) Regulations 2009 and Environmental Quality (Industrial Effluents) Regulations 2009 were enacted to further

strengthen the enforcement of Environmental Quality Act 1974. The Regulations, among others, require the operation of the industrial effluent treatment system to be supervised by competent persons. The owner is also required to operate and maintain the system in accordance with a sound engineering practice. A performance monitoring is also required for the components of the effluent treatment system (Federation of Malaysian Manufacturers, 2009).

Besides the regulatory measures, other types of regulatory mechanisms also persevere to encourage firms to undertake environmental initiatives and avoid harmful effects to the environment. The first of this is the various environmental incentives offered to the manufacturing sector and they encompass the provision of pioneer status inclusive of tax exemption and investment tax allowance for a firm that conducts green initiative programmes such as proper treatment and disposal of toxic and hazardous waste, recycling activities, conservation of energy and generation of renewable energy (Malaysian Industrial Development Authority, 2012).

Previous studies revealed that most firms practice environmental-friendly programmes only because they do not want to violate environmental-related regulations (Luken & Van Rompaey, 2008; Hokey & William, 2001). Therefore, 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 are also under tremendous pressure to behave in a socially responsible manner, also 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 remaining profitable for the benefit of their stakeholders. As demand for socially responsible firms increases, investors, consumers and employees are now more willing to use their individual power to punish firms that do not share their values. A study on Estonian consumers reveals that the respondents would rather pay more for a product or service provided by a socially responsible company than for a cheaper product or service provided by a not so

responsible company (Veersalu, 2011). This claim is further supported by The Global, Socially-Conscious Consumer Survey (Nielsen Company, 2012) which finds that 46 per cent of the respondents are willing to pay more for products and services provided by firms that have implemented programmes that give back to the society. In addition, they also prefer to work for (62 per cent), and invest in (59 per cent) these firms.

Improvements in information and communication technologies have significantly empowered consumers and increased their ability to wield power over firms. As such, firms are expected to develop stronger cultures of corporate social responsibility and to be proactive in seeking ways to honour their moral obligations to society in the 21st century (Dimitriades, 2007). However, in as much as corporate citizenship may be desirable for a society as a whole, it is unlikely to be widely embraced by firms unless corporate citizenship can yield concrete business benefits (Isabelle & Ferrell, 2001), for example, when corporate citizenship activities trigger consumers' active support.

As discussed above, a good reverse logistic programme differentiates a firm from its competitors (Jayaraman & Luo, 2007); hence, implementation of reverse logistics activities is a way to portray good corporate citizenship. Therefore, it is hypothesised that manufacturers will implement or increase the current level of reverse logistics adoption due to corporate citizenship pressure. The fourth hypothesis of this study is thus:

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

4.   Methodology

The population identified for this study consists of all the manufacturing firms located in the three northern states of Peninsular Malaysia, namely Penang, Kedah and Perlis, together with firms located in the Klang Valley (Kuala Lumpur and Selangor). These states, especially Selangor, Penang and Kedah are the centre of manufacturing activities in Malaysia (Malaysia Investment Development Authority, 2013). As most manufacturing firms are located in these states, samples are hereby expected to represent the manufacturing population. The sampling frame used for this study is the Federation of Malaysian Manufacturers (FMM) Directory for the year 2010. A manual count of the directory shows that there were 1356 manufacturers located in the regions mentioned above. They were involved in various industries

with most manufacturers from electrical and electronics, automotive, chemicals and petroleum, food and beverage, and also machinery and fabricated metal industries.

Based on the sample size table developed by Cavana, Delahaye, and Sekaran (2001), the number of samples needed for this study is 300. A simple random sampling method was adopted in selecting the respondents. The list of firms were entered into a spread sheet and assigned with random numbers. The names was then sorted based on the random numbers and the first 500 firms named in the list were chosen as samples for this study.

The survey questionnaire for this study was created based on various scales used in previous studies related to reverse logistics or other related studies. Table 2 lists previous works done and the respective survey items incorporated into this study. The questionnaire consisted of three different sections. Section one required the demographic information of respondents. Section two measured the level of reverse logistics implementation at the respondent firm. In order to measure the current level of reverse logistics adoption among manufacturing firms in Malaysia, respondents were required to rate the level of investment made by their respective firms for reverse logistics, resources allocated for reverse logistics, management commitment and overall involvement towards reverse logistics. A scale of 1 to 5 was used for respondents to rate each item with 1 referred to as the minimum level and 5 as the maximum level. Section three consisted of questions for all four independent variables of the study. Likewise, a five-point Likert scale of 1 to 5 (Strongly disagree to Strongly agree) was used, and respondents were required to rate their level of agreement or disagreement towards each statement given (Appendix 1).

Table 2:   Source of Survey Items for Each Variable

Variables	**Previous research**
Financial/Competitors pressure (FinCom)	Chad, Patricia, and Richey (2001); Evans (2006)
Customer/Stakeholder pressure (CustSH)	Evans (2006); Álvarez-Gil, Berrone, Husillos, and Lado (2007)
Regulatory pressure (RegPres)	Ninlawan, Seksan, Tossapol, and Pilada (2010)
Corporate citizenship pressure (CorpCitz)	Álvarez-Gil et al. (2007)
Reverse logistics level (FinCom)	Rogers andTibben-Lembke (2001)

In total, 500 survey questionnaires were distributed through personal delivery, regular mail, email, and by fax if so requested by the respondent. For regular mail surveys, 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, were 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 the self-administered questionnaire and through emails were omitted from the mailing list. The questionnaire was sent to the key informant within the firm, namely the officer in-charge of the supply chain and logistics operation or the top management of the firm itself. A telephone follow-up call was then made two weeks after the questionnaire was posted as a gentle reminder to respondents. Respondents were assured of anonymity for themselves and their firms, in addition to a guarantee of confidentiality of data provided.

Despite implementing the above procedure to acquire more returned questionnaires, only 104 of the 500 survey questionnaires distributed were completed and returned, making the return rate of 20.8 per cent. This response rate of 104 questionnaires, however, can be considered as acceptable as evidenced in other researches conducted in developing countries (Jharkharia & Shankar, 2006; Thakur & Jain, 2006). In Malaysia itself, there are researches done on manufacturing firms that received response rates of between 9 and 10 per cent only (Sulaiman, 2000) so the current 20.8 per cent rate is considered good. Upon the preliminary screening of all the returned questionnaires, only 101 questionnaires were deemed usable for further data analysis. Three questionnaires were rejected because there were many missing values.

The sample size of 101 is considered adequate for this study as the relationships between the independent and dependent variables were analysed using Partial Least Square (PLS) regression analysis, through the statistical software, SmartPLS 2.0. PLS is a structural equation modelling approach that 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 is also referred to as a soft modelling technique that relaxes many of the data constraints imposed by maximum likelihood estimation techniques. Furthermore, this multivariate statistical technique is more suitable than other SEM software such as Lisrel or AMOS, based on covariance analysis as evidenced by exploratory studies using small samples only (Gefen,

Straub, & Marie-Claude, 2000). SPSS was used for the preliminary data screening and descriptive analysis before PLS analysis was conducted.

5. Findings and Discussion

5.1 Descriptive Statistics

The profiles of the respondents are illustrated in Table 3 showing that 43 respondents (42.6 per cent) are fully owned by foreigners while 33 firms (32.7 per cent) are local firms with no foreign ownership. A total of 22 respondents (21.8 per cent) are companies co-owned by locals and foreigners. In terms of years of operations, Table 3 highlights that 31 respondents (30.7 per cent) have been operating for more than 25 years, 28 respondents (27.7 per cent) have been operating between 6 to 10 years and 24 firms (23.8 per cent) have been operating between 16 to 20 years respectively. Majority of the respondents are large firms, with 64 respondents (63.4 per cent) employing more than 301 employees. Only 23 respondents (22.8 per cent) employ less than 100 employees.

Table 3:   Profile of Sample Firms

Variables N = 101	Categories	Frequency	Percentage
Foreign ownership	None	33	32.7
	1 - 50%	10	9.9
	51 - 99%	12	11.9
	100%	43	42.6
	Missing	3	2.9
Years of operations	< 5 years	6	5.9
	5 - 10 years	28	27.8
	11 - 15 years	6	5.9
	16 - 20 years	24	23.8
	21 - 25 years	6	5.9
	> 25 years	31	30.7
Number of employees	< 100	23	22.8
	100 - 200	7	6.9
	201 - 300	7	6.9
	301 - 400	17	16.8
	401 - 500	5	5.0
	> 500	42	41.6
Annual turnover (RM)	< 1 mil	4	4.0
	1 - 10 mil	17	16.8
	10.1 - 20 mil	16	15.8
	20.1 - 30 mil	3	3.0
	30.1 - 40 mil	6	5.9
	> 40 mil	55	54.5

More than half of the respondents (54.5 per cent) earn more than RM 40 million a year while 33 respondents (32.6 per cent) earn between RM 1 million to RM 20 million annually. Only four respondents (4 per cent) earn less than a million ringgit in revenue annually.

In order to measure the level of reverse logistics adoption, four measures were used, namely the firm's financial investment, resource allocation, management commitment and overall involvement towards reverse logistics activities. Table 4 shows that three out of these four indicators score a mean value of less than 3.0 (average). They are financial investment, resource allocation and overall involvement. Only the mean score for management commitment is more than average, which is 3.12. The overall mean for reverse logistics level is 2.67.

Table 4: Level of Reverse Logistics Adoption

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

5.2 Reliability and Validity

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 as stated in the methodology section earlier. A first draft of the questionnaire was discussed with a few academicians who are experts in logistics and supply chain areas so as to ensure that the items included in the questionnaire were relevant before it was pilot tested on 30 manufacturing firms. The Cronbach Alpha for each variable is above the cut-off level of 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 5 shows the items loading for every variable in the study. There are three items that have loading scores of less than 0.5, which are CorpCitz2, CustSH6 and Fincom1. These items therefore, were removed and not used in the assessment of the structural model analysis. Besides looking at items loading, convergent validity is also considered as adequate when each constructs (variables) have

an Average Variance Extracted (AVE) score of at least 0.5 (Fornell & Larcker, 1981). Table 5 also shows that all constructs have an AVE value of more than 0.5, therefore, it can be concluded that the model has an adequate convergent validity.

Table 5:   Survey Items Loadings

Indicators	Loadings	Composite Reliability	Average Variance Extracted (AVE)
Corporate Citizenship Pressure (CorpCitz)		0.8829	0.6046
CorpCitz1	0.6796		
CorpCitz2	0.2530		
CorpCitz3	0.9398		
CorpCitz4	0.6877		
CorpCitz5	0.7890		
CorpCitz6	0.7324		
Regulatory Pressure (RegPres)		0.8633	0.5174
RegPres1	0.5669		
RegPres2	0.7019		
RegPres3	0.6405		
RegPres4	0.8809		
RegPres5	0.7459		
RegPres6	0.7378		
Customer/Stakeholder Pressure (CustSH)		0.7924	0.5425
CustSH1	0.7407		
CustSH2	0.8560		
CustSH3	0.5567		
CustSH4	0.51503		
CustH5	0.5000		
CustSH6	-0.0759		
Financial/Competitors Pressure (FinCom)		0.7967	0.5429
FinCom1	0.3972		
FinCom2	0.5545		
FinCom3	0.6780		
FinCom4	0.7307		
FinCom5	0.7205		
FinCom6	0.6203		
Reverse Logistics Level (RLlevel)		0.9143	0.7285
RLlevel_Fin	0.8536		
RLlevel_Invnt	0.9035		
RLlevel_Mgmt	0.7443		
RLlevel_Res	0.9031		

Discriminant validity describes the degree in which the operationalisation is not similar to other operationalisation that it theoretically, should not be similar to. Campbell and Fiske (1959) introduce 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 were then 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 by 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 6. The correlations between the constructs are displayed in the lower left off-diagonal elements in the matrix. The average variance shared between the construct and its measurements should be greater than the variance shared between the construct and other constructs in the model (Fornell & Larcker, 1981). Table 6 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 the corporate citizenship's correlation with other constructs (FinCom = 0.343; 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.

Table 6:   Latent Variable Correlation Matrix

	CorpCitz	CustomerSH	FinCom	RL_Level	RegPres
CorpCitz	**0.778**				
CustSH	0.196	**0.737**			
FinCom	0.343	0.343	**0.737**		
RL_Level	0.121	0.240	0.246	**0.853**	
RegPres	0.331	0.215	0.324	0.293	**0.720**

5.3 Result of the Analysis

Table 7 shows the outcome of PLS model analysis and it details the path coefficients, their *t*-values and the level of significance for each

variables. The *T*-distribution table was referred to in order to obtain the *P* value (Degree of freedom, $df = 100$). The result shows that out of four relationships tested, only two are significant, namely between customer/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). 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). In this study, the path coefficient for regulatory pressure is 0.23 thereby indicating a strong relationship with the level of reverse logistics adoption while customer/stakeholder pressure which is 0.15 indicates that it only has a moderate relationship with adoption.

Table 7:   Outcome of Structural Model Analysis

	Sign	Path	T-Value	*P*-Value	Sig
FinCom → RL_Level	+	0.13	0.924	0.1789	No
CustomerSH → 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

Note: ** indicate significance at the 5% level

Meanwhile, the degree in which the PLS model accomplishes its objectives of minimising errors or maximising 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 through independent variables. Falk (2005) suggests that the R^2 value should be more than 0.1, and any value lower than that informs very little even though it is statistically significant. The variance explained values (R^2) for level of reverse logistics adoption is 0.132 which means that the model explains 13.2 per cent of the variance in the level of reverse logistics adoption among manufacturers in Malaysia.

6.   Discussions and Contributions of the Study

The main objective of this study is to empirically investigate the level of reverse logistics adoption and the impact of financial and competitive pressure, customer/stakeholder pressure, regulatory pressure and corporate citizenship pressure on reverse logistics adoption level among

manufacturing firms in Malaysia. The data analysed have led to some major findings. First, the level of reverse logistics adoption among Malaysian manufacturers is still low with a mean score of 2.67. An item by item analysis shows that the levels of investment, resources and overall commitment towards reverse logistics are less than average. It shows that firms are not ready to commit themselves in 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 appears that manufacturers are not ready to invest in and allocate resources even though the management of the company is aware of the benefits of adopting reverse logistics.

Only two out of the four variables utilised in this study have a significant relationship with reverse logistics adoption level, namely regulatory pressure, and customer/stakeholder pressure. This finding could be explained by what is known as coercive isomorphism stated under the institutional theory. According to the institutional theory, firms are coerced into conforming to the expectations of society, especially when they are under pressure from their stakeholders, i.e. customers and the government. In this study, when faced with regulatory pressure (from the government, mostly), firms feel the pressure to adopt reverse logistics in their operations. Hence, there is a significant positive relationship between regulatory pressure and reverse logistics adoption level. The level of reverse logistics adoption, therefore, can be increased by introducing a new regulation or by improving the current existing legislation related to industrial waste management and recycling. This finding noting the positive relationship between environmental regulations and various environmentally friendly practices adopted by firms is also similar to other studies (Porter & Linde, 1995; Khanna, Deltas, & Harrington, 2009; Weng & Lin, 2011) .

Demanding customers and stakeholders, meanwhile have a moderate positive influence on the level of reverse logistics adoption. This finding demonstrates that the government, shareholders, consumers and pressure groups such as NGOs have an influence on a firm's decision and their voices could lead to an increased likelihood of the firm adopting reverse logistics. Consumers are very concerned with environmental issues when buying a product or using a service. A study in the United States shows that 75 per cent of the consumers' purchasing decisions are affected by a firm's environmental reputation while 80 per cent are willing to pay more for environmentally friendly product (Drumwright, 1994). The results of the current study also

indirectly indicate that environmental awareness among consumers and stakeholders in Malaysia influences a firm's decision in adopting the environmental friendly logistics practices such as reverse logistics. Managers are under 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 to satisfy their customers and stakeholders.

This study finds that financial/competitive pressure has no significant impact on reverse logistics adoption. Thus, the findings of this study are in contrast with previous studies which find that there is a tendency showing the intensity with which a firm competes with its competitors in the market can affect its strategic business policies, such as influencing its investment decisions (Grenadier, 2002), increasing its innovation effort (Aghion et al., 2005), or shaping its marketing strategy (Porter, 1979). It is possible that Malaysian manufacturers do not feel the pressure to increase their level of reverse logistics adoption because their competitors are also not concerned with it.

Corporate citizenship pressure, although very popular currently, also does not significantly pressure manufacturers to improve their reverse logistics activities. The findings of this study show that awareness about the importance of sustainable development, environmental protection and corporate social responsibility (CSR) among Malaysian manufacturers is still low as compared to their counterparts in other developing and developed nations. Therefore, there is a need to educate Malaysian manufacturers on the importance of corporate citizenship as a way of improving customer relationship management. Implementation of reverse logistics should be one of the priorities as it reflects corporate citizenship efforts among these firms. However, manufacturers might feel that their involvement in corporate citizenship programme such as sustainable development, CSR or sponsoring any events will reduce their profit although studies have shown otherwise. According to Vogel (2005), firms can improve their financial position through involvement in corporate citizenship activities.

To date, most studies looking at reverse logistics adoption such as those done by Chad et al. (2001), and Alvarez Gil et al. (2007) were conducted in developed countries. It has been noted that the most important factor which influences adoption is different between countries, especially in developed countries where reverse logistics is widely practiced. In this regard, this study expands further by discussing the factors that contribute to an increased level of reverse logistics adoption among manufacturers in developing countries like

Malaysia. The results of this empirical study demonstrate that stricter regulation and strong pressure from customers and stakeholders may also act as drivers that can increase environmental awareness among managers of manufacturing firms and initiate firms' implementation of best practices and activities in reverse logistics. The findings therefore, may serve as a guideline for business managers and most importantly, policy makers in Malaysia, when making policies related to reverse logistics, sustainable development and environmental protection. At the same time, manufacturers can maximise their customer's satisfaction and improve their corporate image if they adhere to the environmental regulations and promote sustainable manufacturing practices such as reverse logistics in their operations. The expected business benefits derived from the reverse logistic operation may propel manufacturers to increase the level of adoption (Eltayib & Zailani, 2011).

This study suggests that it is important for the management of a firm, in particular a manufacturer, to have an understanding of reverse logistics, and the reason why it should seriously enhance the level of reverse logistics activities in its operations. As more manufacturers sell or plan to sell their products in foreign markets, the most important challenge to be met is thus to fulfil the requirements as stated in the regulations related to environmental protection as previously discussed in this paper. The manufacturers must ensure that they comply with the regulations by implementing a proper reverse logistics management that can efficiently manage product returns, and waste or product disposal.

7.   Limitations and Directions for Future Research

There are a few limitations in this study which could provide the leeway to conduct further research. First, the data collected for this study is small due to cost and time constraints. The sample size of this survey is only 101 manufacturers located in the Northern States of the Peninsular Malaysia and the Klang Valley. A research with a greater sample size replicating this survey may use different samples of firms in other sectors such as service sector throughout Malaysia so as to validate current findings. Moreover, this study did not categorise the respondents based on their level of adoption such as high reverse logistics adoption level, low level adopters and also non-adopters which could be further refined and tested as a model. In addition, this study includes all manufacturing industries from all sizes and industries. A replication of this study where the analysis is conducted based on

specific industry or sizes of respondent firms and the respective levels of reverse logistics adoption would provide new insights into the reverse logistics adoption factors. The factors influencing the adoption of reverse logistics could be different between small and medium enterprises (SMEs) and other enterprises.

8. Conclusion

The objective of this study is to identify the level of reverse logistics adoption and the pressure for adoption among manufacturers in Malaysia. 101 companies were involved and based on the research findings, it may be concluded that the level of reverse logistics in Malaysia is still low as manufacturers are not ready to invest and allocate their resources towards reverse logistics activities. Based on the pressure for adoption analysis, two possible means of improving the level of reverse logistics adoption are identified: enforcement of regulations and pressure from stakeholders such as supply chain partners, pressure groups, non-governmental organisations and consumers.

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Appendix 1:   Measurement Instrument

Items	Code
Customer/Stakeholder Pressure	
Customer and stakeholder had the power to influence my company's decision.	CustSH1
The demand made by customer/stakeholder were viewed as important by my company's management team.	CustSH2
Customer/stakeholder is very concern about environmental protection and sustainable development these days.	CustSH3
Continuous improvement in customer service is a priority at my company.	CustSH4
My company will definitely implement any new business initiative if it can handle customer issues more efficiently.	CustSH5
Nowadays, governmental agencies and NGOs are strongly demanding for responsible and sustainable environmental development.	CustSH6
Regulatory Pressure	
Environmental regulations have been intensified over the last few years.	RegPres1
Regulations related to consumer purchase protection have also intensified.	RegPres2
My company has or is in the process of achieving the ISO 14000 Environmental management accreditation.	RegPres3
Customers prefer to do business with companies that have been accredited with ISO 14000.	RegPres4
Pressure for a proper waste management or recycling is higher these days.	RegPres5
Compliance with existing and future environmental regulations is a priority at my company.	RegPres6
Corporate Citizenship Pressure	
Environmental protection and sustainable development is important to my company.	CorpCitz1
My company encourages our customer to return used products to be recycled.	CorpCitz2
My company always sponsors or gets involved in activities related to environmental protection and sustainable development.	CorpCitz3
Relationship with the community is important as it can effect my company's reputation.	CorpCitz4
Green manufacturing or green purchasing practices is one of my company's priorities.	CorpCitz5
Social responsibility to customers and suppliers is important to my company.	CorpCitz6

Financial and competitive pressure	
Providing reliable and efficient services at the lowest possible cost to the customer is our priority	FinCom1
Operational efficiency and cost reduction is a huge concern at my company.	FinCom2
My company had to be committed and invest in reverse logistics activities in order to stay competitive.	FinCom3
Competitors have an effective policy in managing returned goods.	FinCom4
My company seeks to improve its competitiveness by adopting new and innovative ideas.	FinCom5
Customers can easily switch to competitors if they are not satisfied.	FinCom6