A MEDIATING MODEL OF RESOURCE COMMITMENT, REVERSE LOGISTICS AND FINANCIAL PERFORMANCE: IMPORTANCE-PERFORMANCE MAP ANALYSIS

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ABSTRACT

The aim of this paper is to examine a mediating model of resource commitment, reverse logistics and financial performance. In addition, this paper presents the importance-performance map analysis (IMPA) to examine the critical domains of resource commitment and reverse logistics on financial performance. This study conducted a survey among 113 manufacturing companies including first tier and second tier suppliers in automotive industry. The results of the study indicated that important of resource commitment makes reverse logistics program more effective and efficient. The results provide empirical evidence of the mediating impact of reverse logistics on the relationship between resource commitment and financial performance. As the evidence show in this study, the finding has opened new research and development opportunities to identify new alternatives income source to a company and generate benefits from resource commitment in reverse logistic activities while comply with environmental standard.

Keywords: resource commitment; reverse logistics; financial performance; automotive; importance-performance map analysis

INTRODUCTION

It is well known fact that reverse logistics also an essential element in sustainability in term of monetary form as well as ecological performance (Carter and Liane, 2011). Unquestionably, automotive manufacturers can earn sum of economic profits as well as competitive advantages in the industry provided one's reverse logistics operation run effectively and efficiently. Moreover, successful reverse logistics operations not only return with economic savings (Fernando, Sharon, Wahyuni-Td, & Tundys, 2017) but with additionally reputation of environment integrity (Zhang & Zhou, 2013) and environmental savings (Fernando, Shaharudin, & Wahid, 2016). As for reverse logistics is not only business model has capability to contribute additional revenue to manufacturer but to overall health of global economy. One instance example could be referring to Scotland's Environment Secretary Richard Lochhead informed the Holyrood Waste Conference on 5 March 2015 confirmed reverse logistics activities - remanufacturing bring current value of £1.1 billion to the Scottish economy. In matter of fact by year 2020 reverse logistics activity in Scotland will growth up to £620 million and create another 5700 new jobs to the country.

Besides that, based on US International Trade Commission (2012), from year 2009 till year 2011 United States claimed as biggest remanufacturer in this globe which offer 180,000 full time jobs to the country and export remanufacturer goods to worldwide with total amount USD11.7 billion in year 2011. Furthermore, it has been found by reverse logistics activities has been greatly contribute to United Kingdom economy which the remanufacturing industry will continue growing from current revenue £2.4 billion to £5.6 billion. Complementing to economic growth, one of reverse logistics activities – remanufacturing also minimize of energy consumption 85% much lesser compare to manufacturing (Charter & Gray, 2008). Studies have anticipated energy savings by remanufacturing sector globally equals to electricity generated by five nuclear power plants additionally remanufacturing also saves in excess of 800,000 tonnes of carbon dioxide emissions each year too (Charter & Gray, 2008).

At the other corner of globe, reverse logistics activities such as product recovery are noticeable among Asian countries (Fernando, Walters, Ismail, Seo, & Kaimasu, 2018). For instance, China economic growth in clock speed results of booming of manufacturing sector to serve as global factory. At the same time, China also faces environmental degradation at tragic level impact by industrial pollution (Lai et al.,2013). However, to overcome such environmental issue and pursue sustainable development, China manufacturer such as Haier begin to proactive practice reverse logistics operation; two-way closed loop supply chain as they believe reverse logistics

always a good option to adopt and implementing for environment protection (Lai et al., 2013) and prolong environmental performance.

New cars that are produced based on technical and market requirements and are environment oriented are becoming key success factors in the market. To produce an automobile that is well accepted in the market, manufacturing companies must expend resources to develop and design vehicles according to the demands of potential customers (Fernando et al., 2018). Lack of previous studies shown that company is unknown to what really de-motivate initiation to adopt logistics programs as reverse logistics programs known as great potential to reduce costs, increase revenue and generate additional for companies that manage well the process of product returns and recovery management (Eltayeb & Zailani, 2011). Also, uncertainty inside reverse logistics supply chain management such as retuned rate can give rise to manufacturers having more difficulty operating reverse networks compared to their reverse logistics (Zhang & Zhou, 2013). Furthermore, lack of studies in depth of companies are in low financial performance results of implementing reverse logistics as it is an investment to a company. It also views as burdens and liabilities to companies instead of revenues (Abdullah et al., 2011).

LITERATURE REVIEW

Automotive industry in Malaysia is considered growing industry which the sales and export trends have been increase over the years. No doubts, Malaysia automotive industry is core producers and exporters of vehicle parts, components, spare parts and accessories are well known and acceptable by those leading countries namely Japan, United Kingdom, Thailand, Taiwan, Singapore, and Indonesia are major importers (Abdullah et al., 2011).

Automotive Remanufacturing Industry in Malaysia

Based on Malaysia National Automotive Policy 2014, one of the main objectives for automotive industry is moving towards reduction of environmental impact through less energy consumption in order to mitigating the effects of global warming (Shaharudin & Fernando, 2015). In line with Malaysia's obligation to diminish 40 % of carbon intensity by year 2020, the Safety, Security and Environment department will help out in low carbon footprint, increase fuel efficiency, environment preservation and natural resources conservation. Thus, Transformation of Malaysia automotive industry is needed and remanufacturing is one of the vital components in the plan and government has provided guidelines and roadmap namely Malaysia Automotive Remanufacturing Roadmap. Roadmap as a standard to those aftermarket players which included standards, practices also recyclability and recoverability levels of used components and spare parts (NAP,2014). According to the data provided by Malaysia Automotive Association (2015), remanufacturing and used automotive components export value is more than RM2 Billion per annum. Furthermore, 80,000 job opportunities will be created in the automotive product recovery sector. Most of recovery automotive components are characteristically high value as well as required technical expertise and knowledge to recovery. The common recovery parts are included batteries, lubricants, exhaust components, wear and tear parts, filters, collision body, starters and alternators, lighting, tires, and spark plug. Once these spare parts recovered, it will be exported worldwide for sales such as to North America, Europe and South East Asia. Product recovery in automotive industry is economic attractively while improve eco-system in the country (Fernando & Saththasivam, 2017).

Financial Performance

The most important criteria and ultimate goal of any company is to become financially profitable. Financial performance can be measured by maximized revenue, increased profit/lessening of production cost, and improved return on equity as well as cash flow. In term of macro perspective, financial performance is set of indexes to present it success areas in term of overall market strength, financially strong, own assets and liabilities as well as stock price (Benigno et al., 2015). Turnover is the revenue of an organization from its product sale and revenue gross sale or turnover together with asset sales return on equity is the ratio of net income and shareholder's equity, cash-flow reflects any movement of money in or out of a business or product over a particular duration of time. Cash flow can be used to assess quality of income generated by accrual accounting which is the addition of interests or different investments over a period of time (Benigno et al., 2015).

Resource Commitment

Resources commitment deals with how valuables resources are recovered (Richey et al., 2005). It also involves of how well allocation of tangible and intangible resources to company that can be reach maximum of utilization and resell back to different market segment (Richey et al., 2014). Resource commitment particular in reverse logistics activities can be divided into two categories. First group is knowledge-based resources and second group is property-based (Miller & Shamsie, 1996). Based on Richey et al. (2005), knowledge-based resources are critical inputs to reverse logistics capabilities. Company know-how and skills namely technology, human resources, management knowledge are categorizing as knowledge-based resources and these resources are not easily to get it short run. According to Das and Teng (2000), property-based resources are referred to legal permissible properties owned by companies such as machineries, facilities, instruments and equipment handling as well transportation equipment.

Reverse Logistics

In according to Rogers and Tibben-Lemke (1999), they have delineated reverse logistics as a procedure involve well-organized of planning, executing, controlling, cost effective flow of raw materials, work in progress inventory, semi-finished good, finished good and correlated data from point of end consumer to point of origin. This is for reasons of creating value added or suitable disposition. In a study of Stock et al., 2002, reverse logistics activities include product return and product recovery (Fernando et al., 2018) which involved remanufacturing, refurbished, recycling, reuse or disposal of goods. The term of reverse logistics always associated with green or environmental performance in handling or manages products or materials returned at the same time to recapturing value to increase economic performance (Richey et al., 2005). A successful reverse logistics activity will increase company revenue in gaining more market share (Stock, 2001).

Product Return

Financially, product returns mean negative adjustment to company sales. In fact, product returns just a top-line impact. Most companies are unclear of the operational cost for returns because these costs often get buried in the financial line items of facility operations. Each return product incurs transportation to the customer, then back to the company. If replacement product is being sent, a third transportation charge is incurred (Shaharudin et al., 2015). However, based on Norek (2002), product return management is the most negligent activity in the supply chain. Well developed and managed return process in reverse logistics will increase profits of company (Fernando et al., 2017). Thus, product return can be defined as product returned by end customer to send back to factory for disposition such as recycling, recondition, remanufacturing, reuse and so forth to reduce manufacturing cost (Diabat, Kannan, & Mathiyazhagan, 2014).

Product Recovery

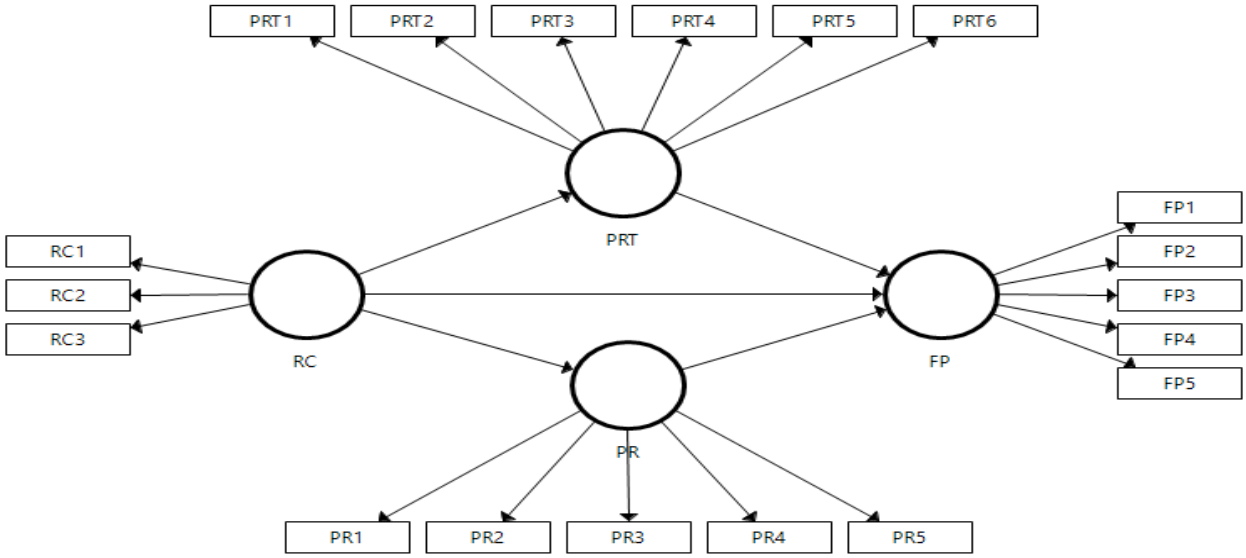
Booming of industries and advancement of technology cause environmental concerns and burden (Fernando, Wah, & Shaharudin, 2016), pressure from government to manufacturer to recover and exploit these used vehicle and dissembled parts and especially those reach stage of end of life (Govindan & Soleimani, 2017). Product recovery also claimed as prolong product life spam with saving of energy and resource materials (Chen, Luo, & Wang, 2017). Based on Thierry et al. (1995), product recovery management can be defined as process to recover used or redundant components, parts, products within manufacturing environment. The purpose of product recovery is to recover as much as possible economic and environmental values as well as to minimize waste proactively. Generally, there are common six strategies of product recovery namely: reuse, repair, recondition and refurbished, remanufacturing, recycling and cannibalization (Vijayaraghavan et al., 2013). Reuse is the simplest way in product recovery through collecting functional components, parts or material from the retired assembly and resale as used materials or continued to use in the market (Ijomah et al., 1999).

THEORETICAL MODEL

The model (Figure 1) is developed based on resource-based view (RBV) theory. RBV approach stated that focused on resource commitment indirectly will increase of overall performance for an organization (Barney, 1991). On the other hand, inadequate in resources commitment impacted badly of overall implemented product returns management even though resource commitment alone not guarantee of successful in performance (Walsh, 2006). RBV theory is relevant to product returns and recovery management in several ways. First of all, RBV describes how companies choose to deploy resources by investing in products returns. Insufficient resource commitment is one of the biggest problems in developing successful product return programs (Walsh,

2006). Furthermore, RBV also describes proactive resources allocation and decision making which emphasizes on internal resources utilization.

Figure 1: Theoretical Model with PLS-SEM



The hypotheses are as follows:

H1a: Resource commitment is positively related to reverse logistics activities of product return.
H1b: Resource commitment is positively related to reverse logistics activities of product recovery.
H2: Resource commitment is positively related to financial performance
H3a: Reverse logistics activities of product return is positively related to financial performance
H3b: Reverse logistics activities of product recovery is positively related to financial performance
H4a: Reverse logistics activities of product return mediates the relationship between resource commitment and financial performance
H4b: Reverse logistics activities of product recovery mediates the relationship between resource commitment and financial performance

METHODS

This study is anticipating the relationship between variables related to the research objectives. This study is a cross-sectional where the data was collected under certain period of time due to time restraint. Besides that, survey methodology will be used as it is suitable for study using cross-sectional (Saunders, Lewis, & Thornhill, 2009). Targeted population for this study is companies involved directly or indirectly in automotive supply chain supply in Malaysia. The sampling frame in this study is based on company listed in the Malaysia Automotive Association (2017) and Malaysia External Trade Development Corporation (MATRADE) 2017 in section of automotive, parts and components on August 2017. List of 622 companies from small medium enterprise (SME) to large companies were extracted from the directories. in this study unit of analysis is the organizations level and respondents are holding managerial position from each respective organization. This is to ensure respondents have adequate knowledge and information in represent their companies. Stratified sampling method technique has been applied as the population characteristic is heterogeneous in term of products, industry and economic sectors. The questions for survey in this study are adopt and adapted from scholarly works. This is to ensure contents of the survey are valid, reliable and properly formatted to minimize probability of misleading and inaccurate recording of responses. The measurement construct items of financial performance were adapted from Lai et al. (2013). The survey items of resource commitment were adapted from Richey et al. (2005) and constructs items of reverse logistics (product return & product recovery) were adopted from Fernando et al. (2017) and Fernando and Tew (2016). To ensure respondents have no issue to understand

all of constructs items, the initial survey was pre-tested with ten industrial practitioners who involved in automotive industry and later their responses were not to be included in the actual data analysis. Two statistical software were used namely IBM SPSS software version 23 as well as professional Smart PLS (partial least squares structural equation modelling (PLS-SEM) version 3.2.7.

RESULTS

A total of 622 questionnaires were disseminated through web-based survey engine based on list of companies listed in Malaysian Automotive Association and MATRADE sub section of automotive, parts and components. The summary of response rate of distributed questionnaire is listed in Table 1.

Table 1: Summary Response Rate

	Numbers	Percentage
Total questionnaire distributed	616	100%
Returned completed questionnaire	113	18.35%
Unresponsive questionnaire (proxy)	503	81.65%

113 responded questionnaires out of total 616 questionnaire distributed were returned and captured with 18.35% response rate. Few factors influencing such least response rate such as respondents are restricted to managerial level position, adoption and involvement in reverse logistics activities such as product recovery, returned merchandize authorization function as well as international certification (ISO standards) certified companies. None of the questionnaire were incomplete as validation "required item" included in questionnaire in order to avoid incomplete form returned. From total 113 responded companies, 47.80% (54 companies) were foreign-owned multi-national corporation (MNC) followed by locally own private companies 32.70% (37 companies), then 13% were locally own public listed company and joint venture ownership totalled 9 companies (8%). Size of company was determined by numbers of employee in one's organization. Large companies comprise of largest respondent groups with 67 companies (59.3%) with combination of two category size of employees ranging between 200 to 500 employees and more than 500 employees. Next, SMEs with total of 40.7% (46 companies). Based on Malaysia Secretariat to the National SME Development Council, 27.4% (31 companies) out of 40.7% were small size companies and 13.3% (15 companies) fall on medium size of companies.

Goodness of Measures

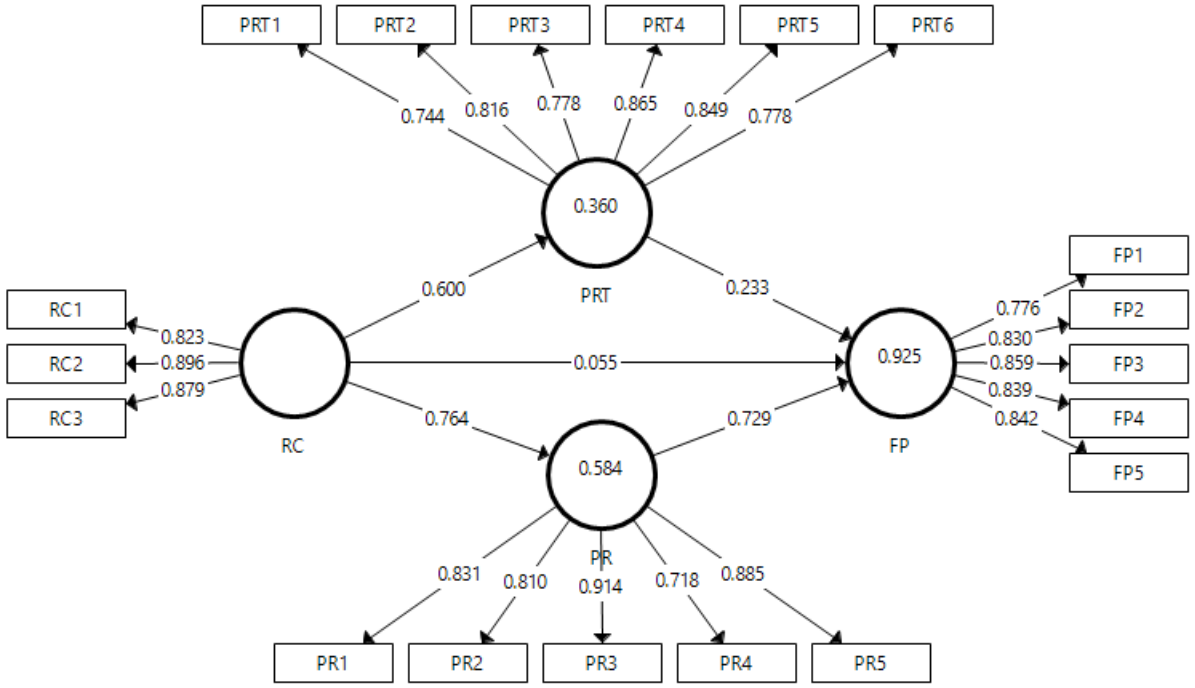
According to Hair, Hult, Ringle and Sarstedt (2017), factor loadings, composite reliability (CR) and average variance extracted (AVE) are for examining convergence validity. The loadings for all items should meet it minimum value. Composite reliability value should be greater than 0.7 cut off value while AVE should be above 0.5 for all constructs. Dijkstra and Henseler (2015) suggest that consistency of reliability needs to use rho_A test and all four variables exceeding the cut-off values. This study contains total 19 items and all items factor loading are greater than 0.7. There is enough evidence to conclude that the data meets the convergence validity requirements (Table 2 and Figure 2).

Table 2: Convergent Validity

	Loadings	Composite Reliability	rho_A	Average Variance Extracted (AVE)
FP1	0.776	0.917	0.89	0.688
FP2	0.830			
FP3	0.859			
FP4	0.839			
FP5	0.842			
PR1	0.831	0.919	0.894	0.696
PR2	0.810			
PR3	0.914			
PR4	0.718			
PR5	0.885			
PRT1	0.744	0.917	0.898	0.65

	Loadings	Composite Reliability	rho_A	Average Variance Extracted (AVE)
PRT2	0.816			
PRT3	0.778			
PRT4	0.865			
PRT5	0.849			
PRT6	0.778			
RC1	0.823	0.9	0.855	0.751
RC2	0.896			
RC3	0.879			

Figure 2: Structured Model (algorithm)



R² value for financial performance 0.793 (79.3%) explained financial variance can be accredited to resource commitment, reverse logistics activities of product return and product recovery. Standardized root mean square residual (SRMR) and normed fit index (NFI) were used to examine the fit measures in structural model (Hair et la., 2017; Bentler & Bonett, 1980; Henseler et al., 2014). The model fit is acceptable for this study with SRMR 0.06 and NFI 0.94. The discriminant validity is a measure for evaluation of the correlations between constructs for potential overlapping constructs. According to Henseler et al. (2014), it was suggested to use Heterotrait-Monotrait (HTMT) criterion as measure of discriminant validity. The model value shows below 0.85, which discriminant validity has been established between two reflective constructs (Table 3). The findings are consistently with the Henseler et al. (2014) rule of thumb.

Table 3: Discriminant Validity: Heterotrait-Monotrait Ratio

	FP	PR	PRT	RC
FP				
PR	0.640			
PRT	0.712	0.837		
RC	0.561	0.479	0.668	

Note: HTMT < 0.85

Hypothesis Testing

Figure 3 and Table 4 show the hypotheses results. Hypothesis H1a predicts that resource commitment has positive significant effect on product return. Result of H1a explained the path was significant at $p < 0.01$ (ß - path coefficient = 0.764; t-value = 10.592). Thus, the H1a is accepted. H1b predicts that resource commitment has a positive and significant on product recovery. The result shown H1b is statically significant at $p < 0.01$ (ß - path coefficient = 0.600; t-value = 8.342). Hypothesis H2 predicts that resource commitment has a positive relationship and significant on financial performance. However, the result illustrated H2 is statistically insignificant at $p > 0.05$ (ß - path coefficient = 0.055; t-value = 1.308), therefore hypothesis H2 is rejected. H3a proposed that product return has a positive relationship and significant on financial performance. The result shown H3a is statically significant at $p < 0.05$ and is positively related (ß - path coefficient = 0.729; t-value = 10.271). Thus, hypothesis H3a is accepted. Hypothesis H3b proposed that product recovery has a positive relationship and significant on financial performance. The result shown H3b is statistically significant at $p < 0.05$ and product recovery is positively related on financial performance (ß - path coefficient = 0.431; t-value = 6.519). Therefore, hypothesis H3a is accepted. Based on Table 3, the intervening variable of product return and recovery were tested for statistical significance at $p < 0.01$ level of significance. H4a is accepted due to product return significantly mediates the path from product return to financial performance (ß - path coefficient = 0.557; t-value = 7.276). In addition, H4b is accepted as t-value 2.781 and 0.140 for ß - path coefficient.

Figure 3: Hypothesized with PLS-SEM Path Model

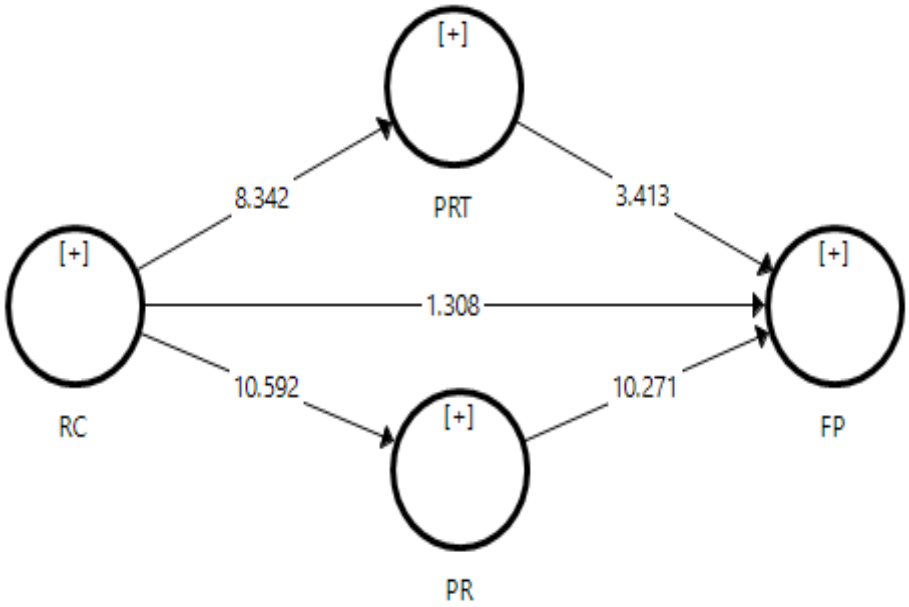


Table 4: Summary of Hypotheses Testing of Initial PLS Path Model

Hypothesis	Path	ß	SE	T value	Confidence Interval Bias Corrected	
H1a	RC -> PR	0.764	0.072	10.592	0.004	0.137
H1b	RC -> PRT	0.600	0.072	8.342	0.042	0.882
H2	RC -> FP	0.055	0.042	1.308	0.139	0.355
H3a	PR -> FP	0.729	0.071	10.271	0.054	0.295
H3b	PRT -> FP	0.233	0.068	3.413	0.597	0.824
H4a	RC -> PR-> FP	0.557	0.077	7.276	0.419	0.670
H4b	RC -> PRT-> FP	0.140	0.050	2.781	0.072	0.230

Importance-Performance Map Analysis

This study has guided by (Ringle & Sarstedt, 2016) to examine the performance level of latent and manifest variables in a PLS-SEM analysis. Importance-performance map analysis (IPMA) is useful for business decision which gives better understanding on the prioritizing business domain. This is because the IMPA not only able to identity the most critical activities for the enhancement of the financial performance, in fact scholars and practitioners can design business strategy to enhance better outcomes. Table 5 shows Financial performance has latent variable index values (4.068) and the greater value of latent variable for performance on resource commitment (69.796). Table 6 and Figure 4 shows the indicators' importance-performance. Form the results, it was found that PR3: Our company collects back used packaging from customers for reuse or recycling, has large importance but has relatively low performance (importance = 0.191, performance = 53.097).

Table 5: Latent Variable Index Values and Performance of the Target Construct FP

	FP	PR	PRT	RC
LV Index Values	4.068	4.056	4.052	4.017
LV Performance	55.917	55.651	54.925	69.796

Figure 4: Importance-Performance Map

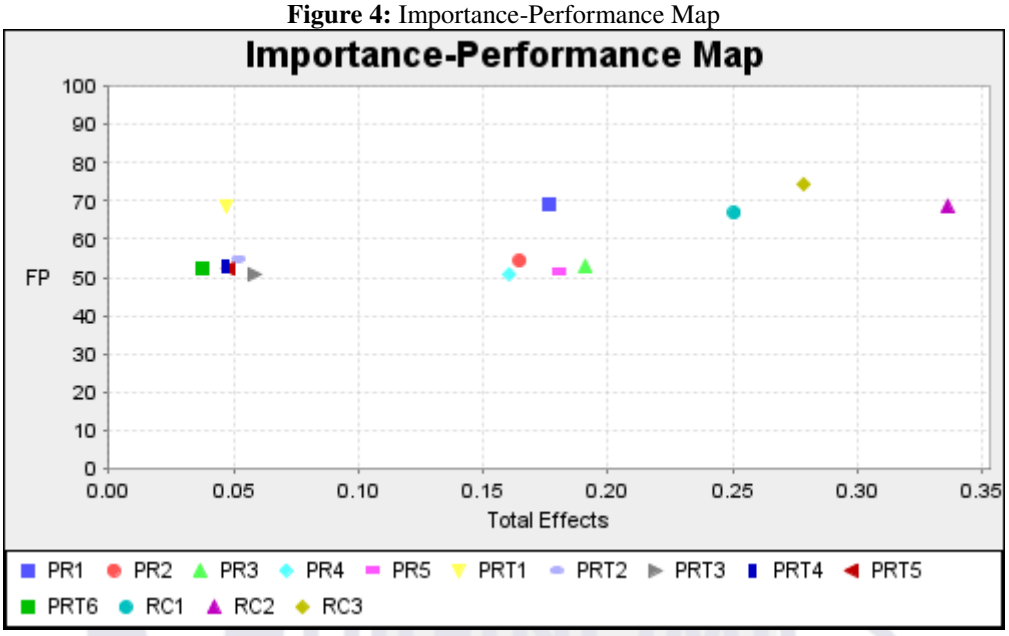


Table 6: Indicators' Importance and Performance of Resource Commitment and Reverse Logistics to the Financial Performance Targeted Construct

	PR	PRT	RC
1	0.176 (69.322)	0.047 (68.732)	0.251 (66.962)
2	0.165 (54.425)	0.052 (54.867)	0.336 (68.437)
3	0.191 (53.097)	0.058 (50.885)	0.279 (74.336)
4	0.161 (50.885)	0.046 (52.655)	
5	0.180 (51.77)	0.048 (55.212)	
6		0.038 (51.212)	

Note: Values in parentheses are indicators' performance.

DISCUSSION

This study found reverse logistics and financial improvements are mostly supported as described in previous literature (Abdullah & Yaakub, 2014; Saxena, Jain, & Sharma, 2018). While resources commitment especially in managerial aspect is suggested as a helpful tool to established effective and efficient product return and recovery management. Only with well-developed and execution of reverse logistics program can reduce cost of companies and generate more revenues to a company. Current trend of business not only looking at the criteria of quality of products as well as contribution towards environment compliances to environment policy (Fernando, Shaharudin, & Wah, 2015) or legislation will increase company revenues as the higher reputation of company in environmental performance attracts more business opportunities. Based on evidence and empirical results of the study, effect of resource commitment to reverse logistics is found to be significant to achieve financial performance. The study extended the RBV theory where the effective resources commitment in term of knowledge-based and property-based improve efficient and effectiveness in reverse logistics. In addition, efficiency in reverse logistics resulting in increase of company revenue and competitive advantage in automotive industry. In other words, the organization is capable to maximize utilization of the resources to achieve sustainability. Noteworthy that reverse logistics program reduced energy consumption; waste and use of raw materials in automotive industry indirectly increase of overall health of environment which benefits to all stage of stakeholders.

In the point of view of organization, additional profits will be generated if adoption of reverse logistics activities fulfil corporate social responsibilities. Also, increase of export business of vehicles used components to ASEAN countries which would increase more employment job opportunities will benefit country's economic growth. Practically, this study will create different point of view towards reverse logistics activities. The empirical results show that reverse logistics bring economic values to companies more than negativity or burdens. Most automotive industry players are keen in forward logistic supply chain and ignore the backward supply chain due to extra burden such as sum of investment cost. However, industrial practitioner should think outside the box on how to sustain company in a long run no matter under favorable or unfavorable economic conditions. Most of the company's financial performance were impacted by economic downturn but reverse logistics offers solution to company to generate alternative income and sustain the business. Automotive manufacturing operations will have ceased due to no demand during economic downturn or technologies disruption because no more demand to spare parts or components. In this case, the management know-how to make use of current facilities, machineries and equipment to improve manufacturing by including reverse logistics or expand business lines to fulfil another market segment such as resale used spare parts and components to secondary market. Certainly, company will make through any financial crisis.

FUTURE RESEARCH AND LIMITATION OF STUDY

Limitation and recommendation of future study are discussed to provide direction and better assist for future scholar as the research questions answered in this study might not be adequately explored. Closer look into product return and recovery management strategies for automotive industry that is remanufacturing is needed as the study only bring up overall product return and recovery management review towards automotive industry not specifically look into depth of remanufacturing and benefits of remanufacturing towards other industry as well.

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