A MODERATING IMPACT OF ISO 14001 CERTIFIED FIRMS ON REVERSE LOGISTICS IMPLEMENTATION: ANALYSIS OF A SECOND-ORDER MODEL

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ABSTRACT

The aim of this study is to investigate the moderating impact of ISO 14001 certified firms on reverse logistics implementation and firm resilience. A proposed model was developed using constructive and reflective constructs with second order analysis. The data was collected from 123 Malaysia automotive industry. The ISO 14001 certified firms have proven moderate the relationship between reverse logistics implementation and firm resilience. The findings contribute to a better understanding in term of critical domains of reverse logistics to safe the manufacturing firms from uncertain business factors and survival. Malaysian automotive industry with the pressure of economic turbulence and quality requirements must be able to manage the sources of raw materials, demand management, production cost and distribution channels to avoid the rising price of automotive products.

Keywords: Remanufacturing; material recycling; green disposal; ISO14001; firm resilience; automotive

INTRODUCTION

The automotive industry is one of the world's most important economic sector and consists of firms that involved in the design and development, manufacturing, marketing and selling of motor vehicles. According to the International Organisation of Motor Vehicle Manufacturers (OICA) (2017) China led the world with 28,118,794 units production of passenger cars, light commercial vehicles followed by United State of America with 12,198,137 units and Japan with 9,204,590 units of auto vehicles production. Malaysia was far below with only 513,445 units productions of vehicles behind two other South East Asia countries such as Thailand and Indonesia with total number of production 1,944,417 and 1,117,389 respectively. On the other hand, based on the ranking by car manufacturer/automaker, Volkswagen Group is one of the highest automobile manufacturers with number of vehicles sold totaling 10.31 million units followed by Toyota 10.18 million units, General Motors 9.9 million units and Renault-Nissan 9.96 million units in 2016 (Statistics Portal, 2017).

According to the OICA (2017), nine million people involve directly in the making of 60 million vehicles including the parts used in the manufacturing process. It is estimated that every direct automotive job supports at least five indirect jobs in the community. Automobiles are built using goods from many industries such as iron, steel, aluminium, glass, plastics, textiles, computer chips, rubber and many other components. In a dynamic business environment that is distinguished by complexity and uncertainty, it is crucial for firms to manage their supply chains effectively as the interconnectivity is very high. Therefore, resilience is important for firms to sustain its business. As noted by Ponomarov and Holcomb (2009) and Wieland and Wallenburg (2013) lack of unified definition of resilience has contributed to the ambiguity of the concept of resilience. These measurement items are used to develop a refined definition of firm resilience. Firm resilience in this study is defined as the capability of the firm to be alert to, adapt to, and quickly respond to changes from customer and competitor reaction. This definition is in accordance with Gilliam and Voss's (2013) criteria of reducing ambiguity and vagueness surrounding the construct and addressing the imbalance between conceptualization and empirical validation of the construct.

The ability to manage resources and reconfigure according to the environmental setting is critical to firm survival and superior firm performance (Fernando, Wah, & Shaharudin, 2016). Thus, this study provides theoretical groundwork for the sustainable logistics and supply chain scholars to enhance firm resilience. This study has conceptualised the moderating effect of environmental management systems (EMS) International Standards Organization (ISO 14001) certified in automotive manufacturing firms. Firm that has ISO 14001 EMS undertakes green practices to improve environmental and social performances of a firm (Fernando &

Saththasivam, 2017). Yet, to what extent implementation of ISO 14001 will enhance the relationship between reverse logistics and firm resilience remain unexplored in the literature. The measurement construct of firm resilience in the context of sustainable logistics and supply chain performance was not establish in the existing literature. This study will present the moderating variable of high degree of ISO implementation to enhance the relationship between reverse logistics and firm resilience. Therefore, from the theoretic view, the role of reverse logistics should not be neglected and firms should pay attention to the coordination of reverse logistics to gain better survival position in the industry. Thus, the empirical findings help to contribute a greater understanding in literature on the relationship between reverse logistics and firm resilience. Thus, this study seeks the theoretical explanation on the rational of automotive manufacturing firms to implement reverse logistics and effect to the firm resilience.

LITERATURE REVIEW

Automotive industry has started to practice recycling and reuse of its product earlier than other industries. The shift in business model from traditional manufacturing to a more sustainable solution caused mainly by the application of a number of European Union Directives e.g. end-of-life vehicles (ELV) Directive 2000/53/EC in the Europeans union. The Directive on ELV set a minimum standard for the acceptance of recycling and disposal in European automotive industries which they have to satisfy 85% recoverability in their ELV by 2006 and 95% by 2015 (Gerrard & Kandlikar, 2007). These products take-back regulations not only influence the design of the vehicles, technologies used but also the configuration of its supply chain. The process of reverse logistics in automotive industry may have a few challenges in operating cost and raw materials where the collection is depending on the quality or condition, source of collection and management of the inventory. It is crucial how firm manage the risk and react to those disruption and changes in order to maintain in the operation.

Underpinning theory

The theory used in this study to explain the relationship of firm resilience to operational risk is contingency theory. This theory posits that firm performance depends on firm's places in the environment its operating and depending on the structure of firm and processes (Laurence & Lorsch, 1986; Thompson, 1967; Miller, 1987). From this perspective, firms are seeking ways to improve their performance by improving alignment and fit with their own definition set of contingency variables and hence the changing external environment. This process is viewed as a dynamic and ongoing process especially in fast moving business environments (Daft et al., 2010; Burns & Stalker, 1961). Contingency theory is useful to explain limited establishment of theoretical framework (Sousa & Voss, 2008) with a contextually grounded approaches based on contingency fit rather than a single best way to manage a firm (Drazin & Van De Ven, 1985). It is concluded that in more simple and stable environments, practices tend to be simpler and more standardised and firm's structure is more mechanistic in nature whereby, when the business environment becomes more dynamic and increases in complexity, firm tend to be more complex or advanced with an emphasis on adaptability to any given context rather than a one size fits all (McAdam, Miller, & McSorley, 2016).

Firm resilience

Organization often been defined as complex social systems that must possess an ability to adjust and morph in response to their competitive environment which organization operate in both volatile and uncertain. Economic shocks are seemingly becoming ever more frequent, and the effects of globalization remain ongoing. Firms that are resilient will conquer many challenges that will confront them. Being able to operate in the face of disruptions and react to environmental changes indicate the presence of this vital quality (Fernando, Sharon, Wahyuni-Td & Tundys, 2017). The ultimate measure is continued business objectives even in the face of apparent adversity. Resilience incorporates two related dimensions labelled as strategic resilience which focuses on diversification to meet the demands of changing situations, incorporates the necessary adjustment of business models and strategies. In addition, operational resilience is where it possesses the ability to function properly within circumstances that remain static. Firms exhibiting operational resistance will specialize and optimize their systems. On the other hand, inadequate resilience negatively impacts on organizational output. Resource wastefulness is one probable consequence in this situation (Alves, de Sousa Jabbour, & Jabbour, 2017).

Reverse Logistics

There are three important parts in reverse logistics which are remanufacturing, material recycling and green disposal (Fernando, et al., 2017). Resources that are recovered will re-enter the product life cycle and eliminate

the input of virgin materials through directly reusing the product at the end of its useful life. Other than that, reverse logistics also enable firms to reuse some parts, and reuse remanufacturing parts, reuse recycling materials that leads to a decrease in the consumption of virgin materials, reduce disposal of waste, savings in terms of energy consumption for processing (Giudice, La Rosa, & Risitano, 2006; Fernando, Shaharudin, & Wahid, 2016). Remanufactured products undergo an extensive process compared to recycling, reconditioning or refurbishing processes and therefore produce better result in terms of quality (Armacost et al., 2002). In comparison with recycling, remanufacturing is categorized as a strategy for product recovery while recycling is more likely a strategy for material recovery (Gungor & Gupta, 1999). Since remanufacturing processes retained the product's identity while keeping the quality performance at an optimum level, typically it imparts the advantages of eco-efficiency and effectiveness of asset recovery (Nasr & Thurston, 2006).

Remanufacturing

In some experienced country like Japan, remanufacturing practices lead to improvement of strong quality control of the product, development of process know-how and manpower skills and efficiency process to improve the whole supply chain (Matsumoto & Umeda, 2011). Nevertheless, in the context of implementing 'design for remanufacturing' in organization, extra processes will incur, which in turn means extra time, resulting in further investment on more special equipment, as well as engineer trainings to adopt new advanced skill on remanufacturing. In this case, the allocation of a certain amount of their budget need to be included so as to plan for expansions of the current production line in coping with the additional processes and its technologies (Tian, Chu, Hu, & Li, 2014; Wang, Chen, & Liu, 2017).

Material Recycling

According to Guide & Van Wassenhove, (2009), reverse logistics is now a revenue opportunity for manufacturers instead of a cost-minimization approach. For example, in the electrical and electronic industry, past studies have proven that many mobile phones are not disposed properly (through reuse or recycling) but are instead stockpiled. Based on reuse and recycling data in United Kingdom and in the USA, it shows that mobile phones reuse has a healthy profit margin and many have been reused (Geyer & Blass, 2010). In automotive industry, the process to turn ELV to solid wastes requires energy consumption (Fernando & Hor, 2017) and will produce high air emissions (Shaharudin & Fernando, 2015) that would cause negative impact to the environment (Zailani, Govindan, Iranmanesh, Shaharudin & Chong, 2015).

Green Disposal

Waste management refers to the treatment of solid wastes, liquid wastes, or atmospheric emissions prior to their release to the environment (Xu, Elomri, Pokharel, Zhang, Ming, & Liu, 2017). Disposal and dismantling procedures should be standardized and the technology should be widely used (Li, Bai,Yin & Xu, 2016). According to Sarkis, (2003) there are five main elements that impact the management of wastes generated along the supply chain; reduction, reuse, remanufacture, recycling, and alternative waste destinations. Apart from that, Srivastava (2007) also stated that waste management consists of three actions: prevention, pollution reduction, and final disposal. "Recycle" involves the process of converting material that would otherwise be considered waste into new materials or products (Jayal et al., 2010). The disposal of ELV is critical and raising high concern to achieve sustainability. A maximum material recycling and recovery are needed to reduce wastages. This will indirectly change the image of automobile industry (Testa & Iraldo, 2010).

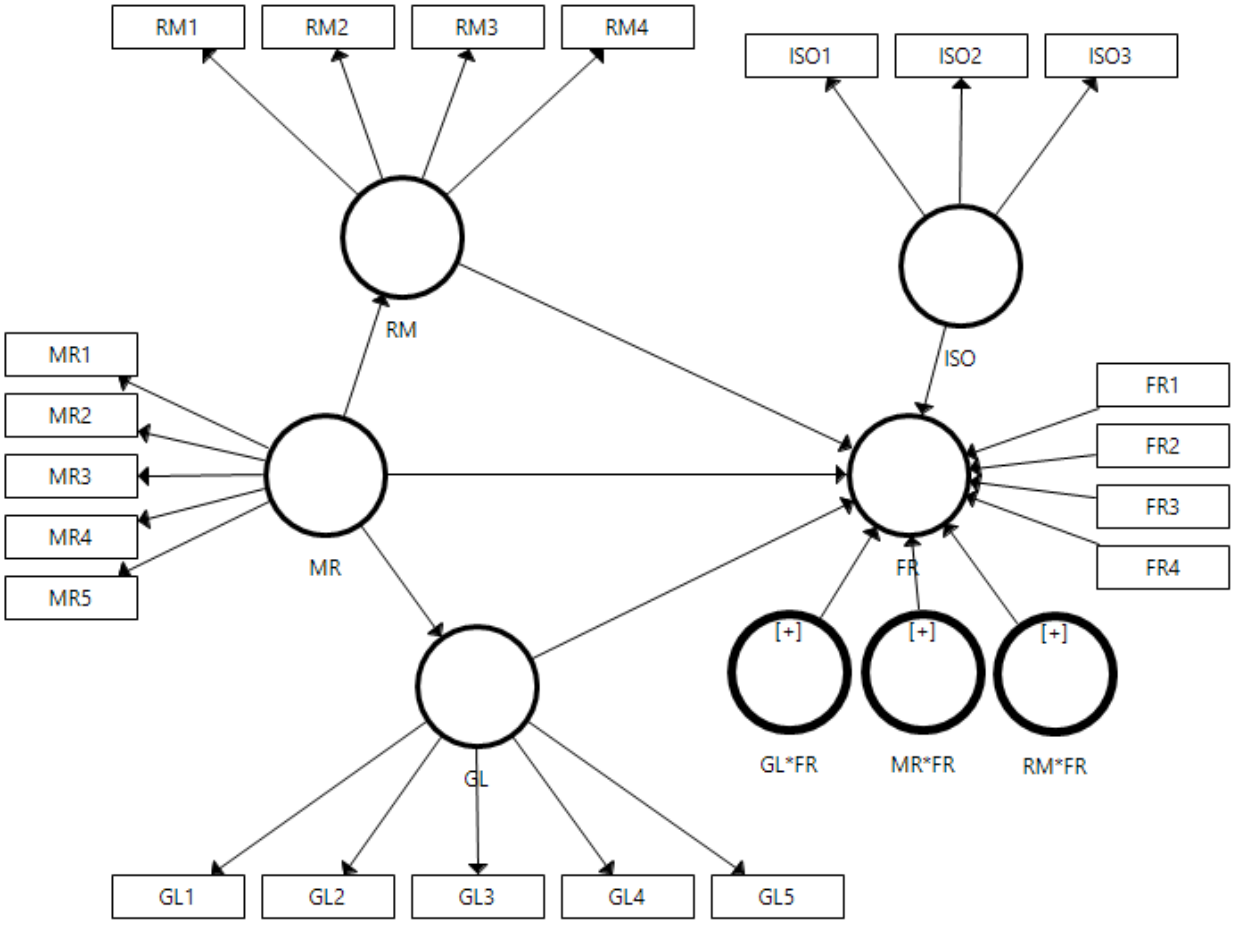
Hypothesis Development

Firms have realized that reverse logistics can be used to gain competitive advantage (Yu & Solvang, 2018) and achieve sustainable development (Khor & Udin, 2013). For example, in a common form of close loop supply chain, a manufacturer collects used products to gain benefits (De Giovanni & Zaccour, 2014). To facilitate collecting, firms usually exert collection effort such as product design and process modification towards recycle, advertising and communication campaigns about the recycling policies, reverse logistics services, monetary and symbolic incentives, and employees-training programs. These activities reflect firm's environmentally responsible features and enhance the firm's reputation, satisfy the consumers' environmental concerns and simplify their disposal process (Hong & Yeh, 2012). In order to gain economic and environmental benefits, it is well-noted that the investment in collection effort will positively influences the return rate and enhance market demand (Gao et al., 2016).

In the literature, the ISO 14001 certified automotive manufacturing firms that practice reverse logistics tend to have better performance than non-ISO 14001 ones (Fernando & Saththasivam, 2017; Fernando, Bee, Jabbour, & Thome, 2018). Despite not all of ISO certified automotive firms were achieving high level of implementation, still some firms face challenges to accomplish ISO 14001. This study has conceptualised automotive manufacturing firms that practice ISO 14001 to moderates the relationship between reverse logistics domains and firm resilience. Thus, it is hypothesized direct effect that the reverse logistics domains positively affect firm resilience. Furthermore, automotive manufacturing firms which practices ISO 14001 will have moderating effect on the relationship between reverse logistics and firm resilience. A research model is presented in Figure 1 and hypotheses are as follows:

Hypothesis 1: There is a positive and significant relationship between material and recycling and remanufacturing
Hypothesis 2: There is a positive and significant relationship between material and recycling and green disposal
Hypothesis 3: There is a positive and significant relationship between material and recycling and firm resilience
Hypothesis 4: There is a positive and significant relationship between remanufacturing and firm resilience
Hypothesis 5: There is a positive and significant relationship between green disposal and firm resilience
Hypothesis 6: The higher degree of ISO 14001 implementation moderates the relationship between material and recycling and firm resilience
Hypothesis 7: The higher degree of ISO 14001 implementation moderates the relationship between remanufacturing and firm resilience
Hypothesis 8: The higher degree of ISO 14001 implementation moderates the relationship between remanufacturing and green disposal and firm resilience

Figure 1: Theoretical model



METHODS

The population that will be focused on in this study is automotive firms in Malaysia. The sampling frame is collected from Official portal of Malaysia External Trade Development Corporation (MATRADE). There are total of 712 automotive firms (including, first tier, second tier and third tier suppliers) that were found and listed under 26 sub-categories (MATRADE, 2017). Therefore, the appropriate person from which required data could be obtained should ideally have knowledge and access to aspects of supply chain, operations and reverse logistics. In order to conduct the research successfully, the most appropriate respondent proposed for this study are the operation/ supply chain managers and purchasing managers as they are niche of this study is the operation and supply chain management. Apart from that, the purchasing managers were also chosen as the relevant respondent as they are involved in purchasing with regards to the reverse logistics activities. The stratified random sampling technique was used in this study due to diverse population and varies in its functions. This study made an online survey of the automotive firms in Malaysia due to time and cost constraint. The three domains of reverse logistics measurement construct items were adapted from Fernando and Tew (2016) and Fernando et al. (2017). The EMS ISO 14001 construct items were adapted from Department of Standards Malaysia (2018) and measurement items for firm resilience were adapted from Ambulkar et al. (2015). The data collection method comprises of several stages and phases of measurement selection describe as follows. First phase is to generate potential items and it is developed based on literature review. In this phase, the investigation area and the research problem is identified. Then in the second phase, the structured questionnaires are developed before the online survey conducted. The online survey attached with the cover letter then is addressed to the relevant respondents via mail survey technique. In the third phase, the data is collected and the data entry in the statistical software is done. The literature and results of the data collection are treated as the theoretical foundation. In this study, the data collected need to be tested using several statistical software such as IBM SPSS software version 23 and SmartPLS software version 3.2.7 In this stage, this study will examine the structural model fit and the research hypothesis is tested using the above statistical techniques.

RESULTS

Four hundred links of questionnaires were sent via online survey to the management of automotive firms in Malaysia. The survey was conducted in February 2017. Total 123 of questionnaires were used in the analysis out of 400 distributed. After three days from the initial emailing to request the participation, further follow up techniques were made such as e-mail reminder and phone call to increase the response rate. Close follow up to the respective respondents were considered and made to the non-response respondents after all the follow up techniques mentioned earlier failed as most of the firm think that they are not implementing the reverse logistics. None of the questionnaires collected were considered as blank or partial incomplete as the Google drive's questionnaires are set as "required' to answer before the respondents can proceed to the next section of the questionnaire. Respondents are classified according to their gender, age, position held in the firm, highest education level and years in service with the current firm. Of all 123 surveys collected there are 48.8% male respondents as compared to female (51.2%) who took part in this study.

Respondents' age below 35 contributed to the higher percentage of this survey which corresponding to 52.8% followed by 35-50 years of age which covered 45.5%. Only 1.6% of the respondents are from the age of 51-65 years old. None of the respondents ranged more than 65 years old. The majority of respondents participate in this survey possessed Bachelor's degree which comprises of 55.3% while 26.8% are Master degree holder. Other than that, 14.6% of the respondents are certificate or diploma holder meanwhile only 3.3% of the total respondents are Doctorate or PhD holder. From the total of 123 response collected, 43.9% of the firms have been in the operation more than fifteen years thus accounted for 54 firms. The second highest percentage are firms that have been in the operation around 5 to 10 years with a score of 20.3% followed by firms in the operation for less than 5 years with 16.7%. Firm with the years in business from 11 to 15 years scored the lowest 17.1% with a total of 21 firms. Since the sample is firm with ISO 14001 that is why it is assumed that in Malaysia only established and firms with more than 10 years operation will go for environmental certification.

Goodness of measures

Construct validity is divided into two sections: that is convergent validity and discriminant validity. The function of the construct validity is to measure the constructs that are theoretically should be related to each other (meaning the ability to show a correspondence or convergence between similar constructs) and discriminant validity which means measurement of the constructs that theoretically should not related to each other. In other words, the ability to discriminate between dissimilar constructs. Convergent validity is evaluated using factor loadings, rho_A and the average extracted variance (AVE) as stated by Hair et al. (2017) and

Dijkstra and Henseler (2015). The main objective in conducting this test is to determine whether the degree of the two measures of constructs are highly correlated (Sekaran & Bougie, 2016). The AVE must be greater than 0.5 where it measures the variance using the indicators relative to measurement error (Barclay et al., 1995) and rho_A values are expected more than 0.70 (Dijkstra & Henseler, 2015). Table 1 and Figure 2 shows all the loadings above 0.70 and rho_A values were more than 0.70. Three domains of reverse logistics were examined using reflective construct. On the other hand, firm resilience was measured using four formative construct items with rho_A = 1 and AVE value not available. This study has tested variance inflation factor (VIF) to evaluate the best formative measurement model. The VIF values were ranged from 1.679 (FR1) to 2.213 (FR2). VIF value for FR3 = 2.123 and FR4 = 1.861 respectively. According to Ringle et. al (2013), the acceptance VIF values are normally ranged from 0.20 to 5.0. This study has concluded that all constructs items of formative construct achieved the requirement for formative measurement model. There is enough evidence to conclude that this study has established the convergent validity.

Figure 2: Structured Model (algorithm)

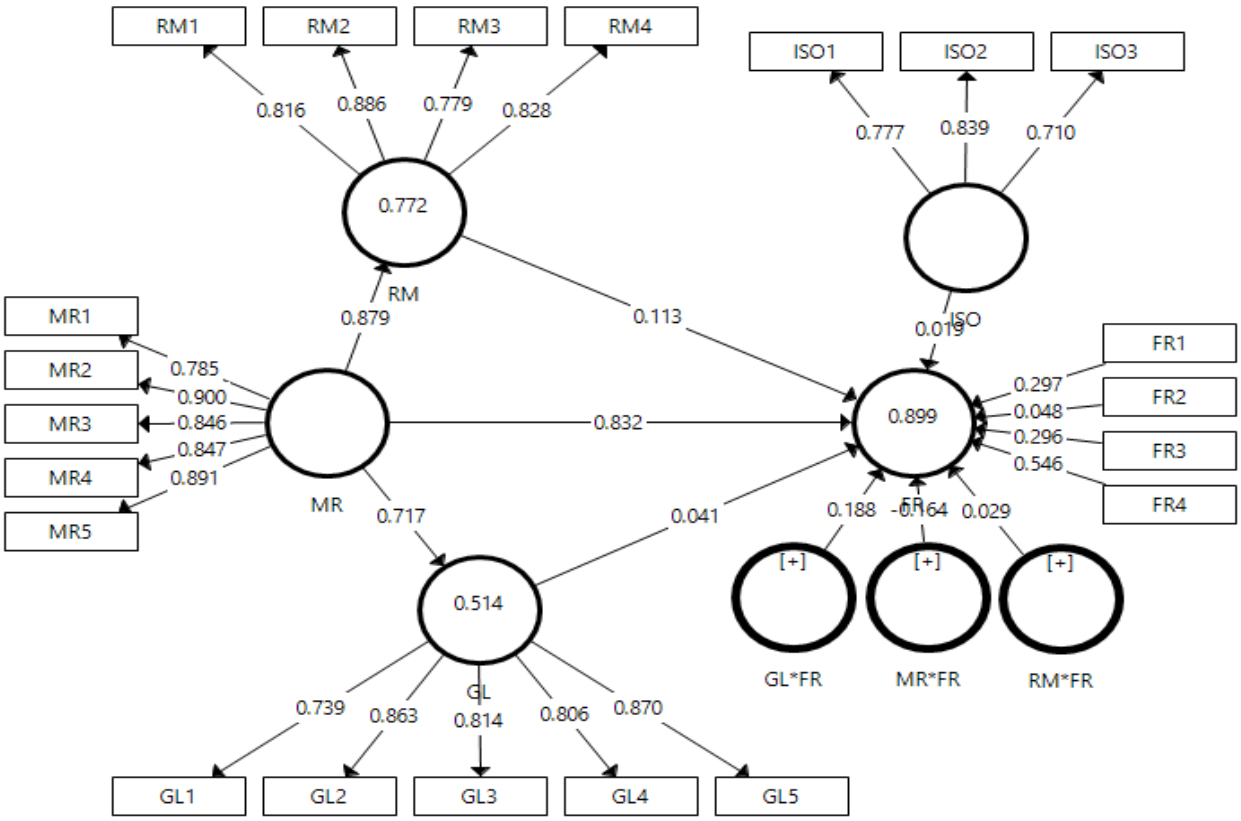


Table 1: Results of convergent validity

	Loadings	rho_A	Average Variance Extracted (AVE)
FR1	0.789	0.090[a]	N/A[a]
FR2	0.727		
FR3	0.787		
FR4	0.912		
GL1	0.739	0.885[b]	0.672[b]
GL2	0.863		
GL3	0.814		
GL4	0.806		
GL5	0.870		
ISO1	0.777	0.721[b]	0.604[b]
ISO2	0.839		
ISO3	0.710		
MR1	0.785	0.907[b]	0.731[b]
MR2	0.90		
MR3	0.846		
MR4	0.847		
MR5	0.891		
RM1	0.816	0.847[b]	0.686[b]
RM2	0.886		
RM3	0.779		
RM4	0.828		

Note: *[a] = formative Construct; [b] = reflective construct*

Three domains of reverse logistics were regressed on the firm resilience with R^2 value 0.575. Thus, this is implicitly positing that 57.5 % of firm resilience variance can be explained by green disposal, remanufacturing and material recycle. 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). Our model is acceptable fit with SRMR 0.082 and NFI 0.899 (close to 0.90). The discriminant validity is a measure for evaluation of the correlations between constructs for potential overlapping constructs. According to Henseler et al. (2014) study suggested to use Heterotrait-Monotrait (HTMT) criterion as measure of discriminant validity. The model value which below 0.85, discriminant validity has been established between two reflective constructs (Table 3). Our findings are consistently with the Henseler et al. (2014) rule of thumb.

Table 2: Discriminant Validity of Heterotrait-Monotrait Ratio

	GL	ISO	MR	RM
GL				
ISO	0.061			
MR	0.798	0.657		
RM	0.775	0.051	0.601	

Note: discriminant validity is established at HTMT0.85.

Hypothesis Testing

Figure 3 and Table 4 show the hypotheses results. Hypothesis H1a predicts that material recycle has a positive and significant impact on remanufacturing. Result of H1 shows path of direction was significant at $p < 0.01$ (ß - path coefficient = 0.879; t-value = 31.911). Thus, the H1 is accepted. H2 posits that material recycle has a positive and significant on green disposal. The result shown H2 is statistically significant at $p < 0.01$ (ß - path coefficient = 0.717; t-value = 10.209). H3 predicts that material recycle has a positive relationship and significant on firm resilience. The result illustrated H3 is statistically significant at $p < 0.01$ (ß - path coefficient

= 0.832; t-value = 8.745), therefore H3 is accepted. Another two hypotheses on direct relationship between independent variable and dependent variables were tested with insignificant results. H4 proposed that remanufacturing has a positive relationship and significant on firm resilience. The result shown H4 is statically not significant at $p > 0.05$ (ß - path coefficient = 0.113; t-value = 1.135). Thus, H4 is rejected. The result shown H5 is not statistically significant at $p > 0.05$. It means that green disposal is not related to firm resilience (ß - path coefficient = 0.041; t-value = 0.619). Therefore, H5 is rejected. The higher level of ISO implementation was moderately influencing the relationship between material recycle and firm resilience with significant level at $p < 0.05$ (ß - path coefficient = 0.164; t-value = 1.922). H6 is accepted and depicted in Figure 5. The relationship between remanufacturing and firm resilience was not influence by moderator variable of higher level of ISO implementation (ß - path coefficient = 0.029; t-value = 0.759). There is not enough evidence to accept the H7 ($p > 0.05$). The higher level of ISO implementation as a moderator variable has statistical evident to influence the link from green disposal to firm resilience at $p < 0.01$ (ß - path coefficient = 0.188; t-value = 2.466). The H8 is accepted and depicted in Figure 6. A blindfolding procedure is conducted with CV redundancy (Q^2) at 0.540 implies that the model has predictive relevance (Figure 6). According to Hair et al. (2017), results of Q^2 implies that the exogenous constructs possess predictive ability over the endogenous construct.

Figure 3: Hypothesized with PLS-SEM Path Model

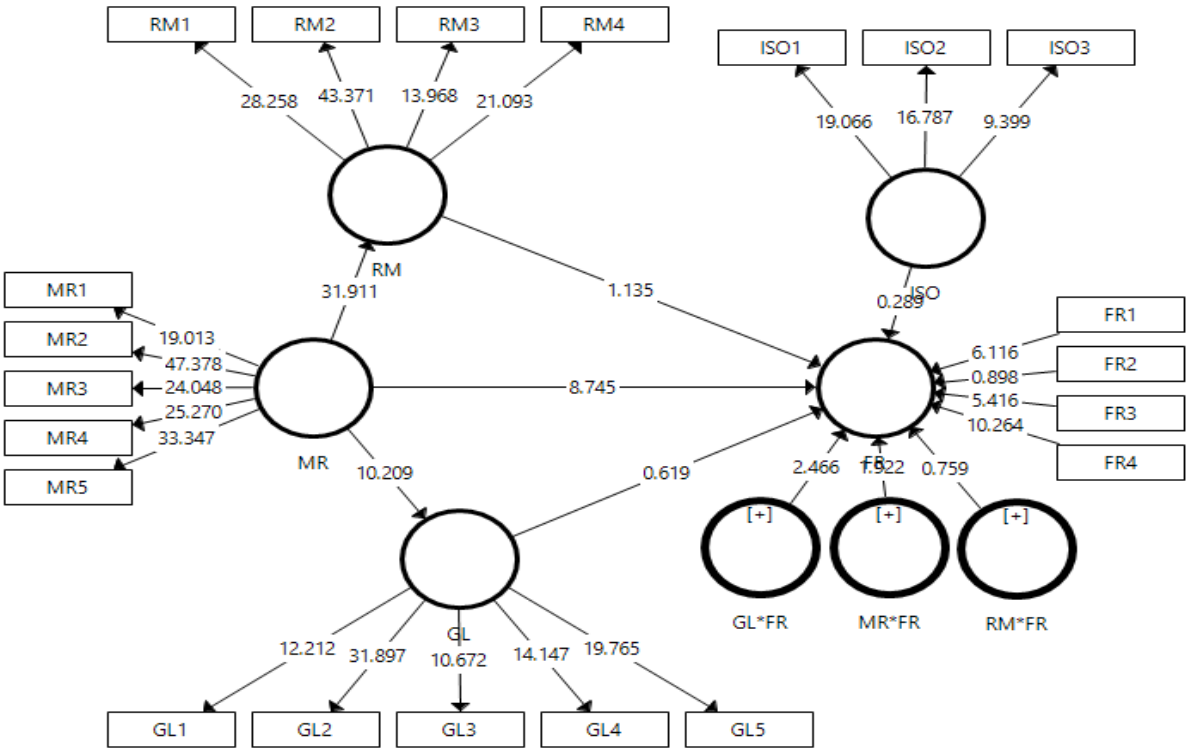


Table 4: Summary of Hypotheses Testing of PLS Path Model

Hypothesis	Path	ß	SE	t-statistic	Confidence Interval Bias Corrected 2.5%	97.5%
H1	MR -> RM	0.879	0.028	31.911	0.812	0.923
H2	MR -> GL	0.717	0.070	10.209	0.552	0.839
H3	MR -> FR	0.832	0.095	8.745	0.651	1.001
H4	RM -> FR	0.113	0.10	1.135	-0.081	0.299
H5	GL -> FR	0.041	0.066	0.619	-0.083	0.183
H6	MR*ISO -> FR	0.164	0.085	1.922	0.321	0.236
H7	RM* ISO -> FR	0.029	0.039	0.759	-0.043	0.101
H8	GL* ISO -> FR	0.188	0.076	2.466	0.041	0.337

Figure 4: The interaction between ISO 14001 and material recycle in predicting firm resilience

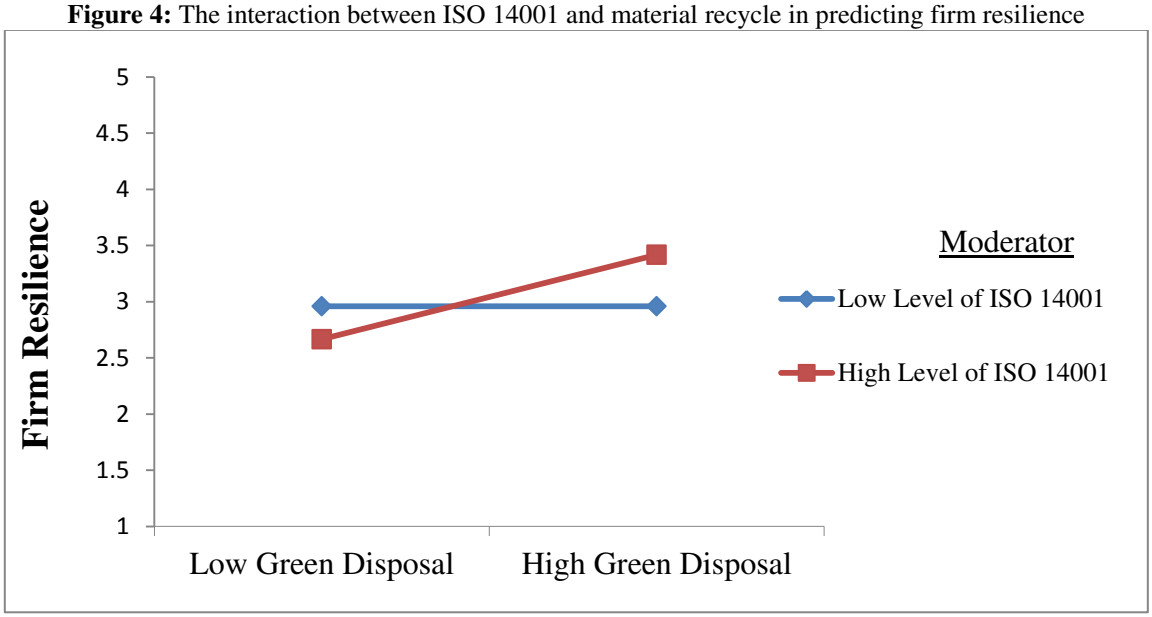


Figure 5: The interaction between ISO 14001 and green disposal in predicting firm resilience

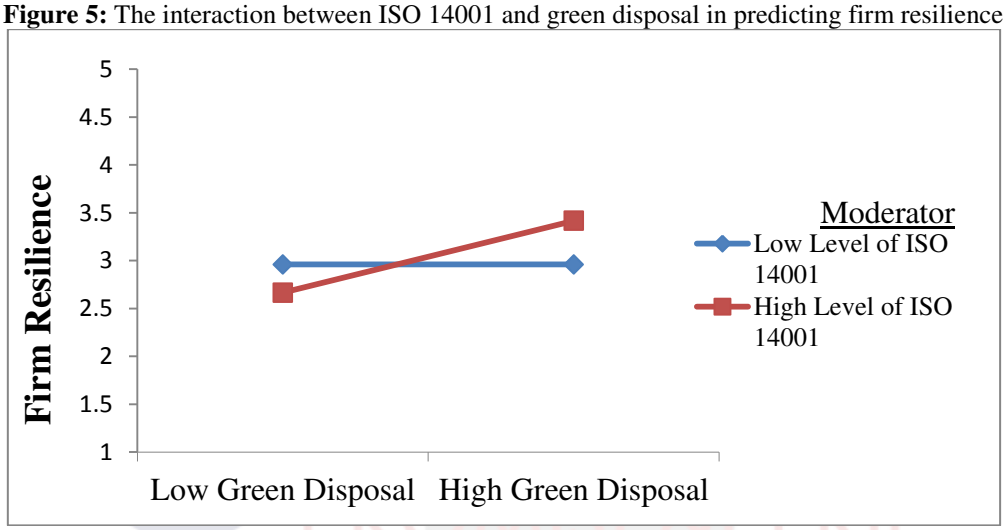
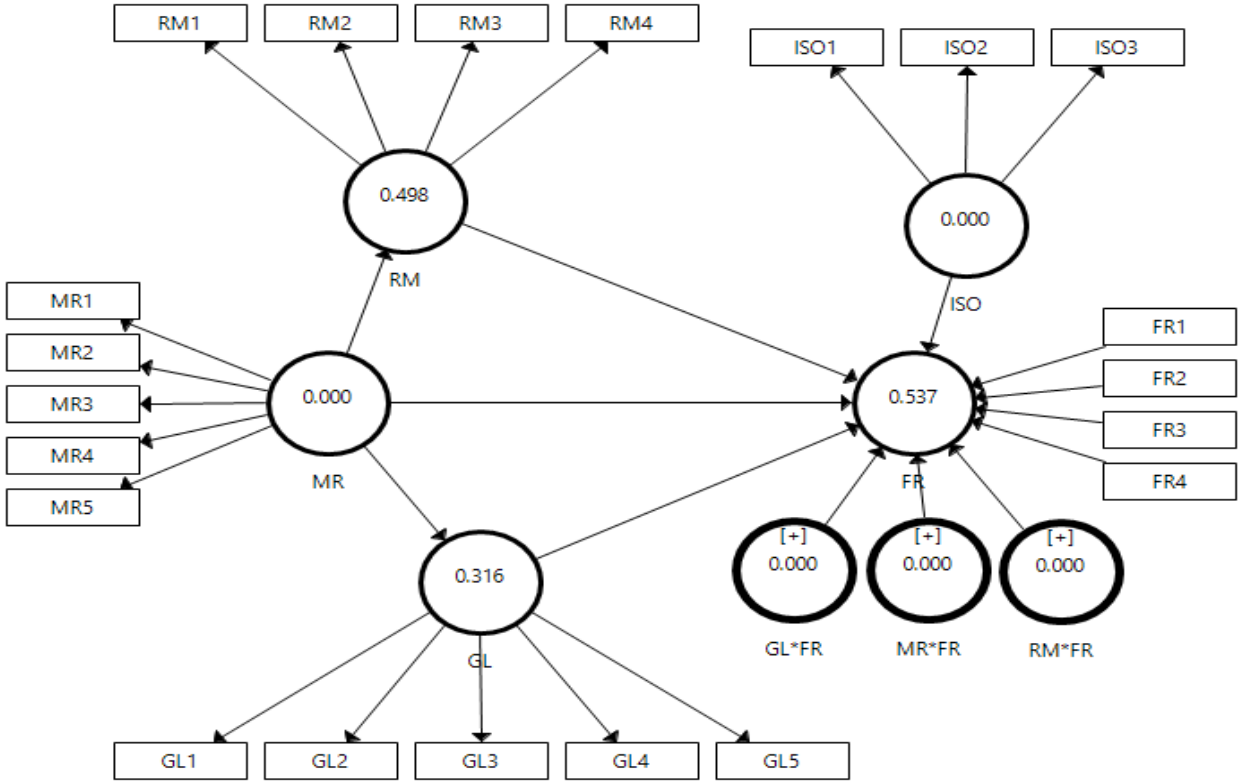


Figure 6: Blindfolding procedure (=1-SSE/SSO)



DISCUSSION

This study found that reverse logistics domains largely are supported by previous studies (Benjamin, Overstreet, Hall, Huscroft, & Hanna, 2015; Jayaram & Avittathur, 2015). In this study, material recycle is found to have a positive and significant impact on reverse logistics domains such as remanufacturing and green disposal. This is attributes to recycling of materials and collecting back disposable products have been key components of successful implementation of reverse logistics. Furthermore, automotive manufacturing firms have been practicing recycling of materials and automotive parts throughout its supply chain. This is evident in this study and previous findings (Lin, Chen, & Nguyen, 2011; Alvarez-Gil, Berrone, Husillos, & Lado, 2007; Tian, et al., 2014). Results show that material recycle and green disposal are considered first phase of reverse logistics practices in manufacturing. Therefore, for automotive manufacturers that are considering of practicing reverse logistics should start with material recycling and green disposal. Automotive manufacturers also practicing reverse logistics to reduce cost of material acquisition and cost of environmental fines. Benefits of practicing reverse logistics lead automotive manufacturing firms to achieve firm resilience. In other words, by practicing reverse logistics, automotive manufacturers are able to sustain its business in a competitive environment such as automotive industry and able to overcome disruption of supply chain through being resilient in a dynamic business environment. Contingency theory also claimed that by being resilient, firms are able to adapt to disturbance, risks and volatile environment exposed to firms. Therefore, practicing reverse logistics also enabled automotive manufacturing firms to achieve risk averse, firm sustainability and economic performance. Perhaps wider investigation on firm resilience with other performance variables will help to develop more robust reverse logistics model for Malaysian automotive industry.

Findings of this study in regards to remanufacturing and green disposal on firm resilience were found to be insignificant can be explained through reverse logistics practice in Malaysia still in evolving phase. This is in line with the finding of Abdullah and Yaakub (2014). However, findings also show that ISO 14001 does moderate the relationship between green disposal and firm resilience. This shows that firms that have ISO 14001 certificate are more concern with environment and tend to increase green practices at their firms' supply chain. Even though firms believed that green disposal does not contributing to firm resilience, but with ISO 14001, firms agreed to practice green disposal so that firms can meet the environmental standards and "fit" in the business environment. Automotive manufacturers also are required to practice green disposal when exporting vehicles to countries with stringent environmental regulations. Thus, ISO 14001 automotive manufacturers will

adapt to more stringent environmental regulations to achieve resilience. On the other hand, for remanufacturing practice is low in Malaysia due to the volume of automotive vehicles are not high enough to warrant firms to increase reuse of automotive parts and materials when available resources are abundant in Malaysia. In order to increase practice of remanufacturing, demand for automotive vehicles should be higher than the supply so that limited resources will push automotive firms to find more efficient way to prolong the life cycle of vehicles. Furthermore, Malaysia is a destination for manufacturing firms. Therefore, automotive firms base in Malaysia are assembling and exporting completed vehicles to other countries rather than investing in new technologies that requires remanufacturing.

As ISO 14001 standards help to moderates the relationship between green disposal and firm resilience, higher degree of ISO implementation also influences the relationship of material recycle and firm resilience. In the literature, ISO 14001 certification has been one of the criteria for internal environmental management practice (Zhu, Sarkis, & Lai, 2013). This shows that ISO certification is impacting on firm resilient and performance. A study by Nishitani, Kokubu & Kajiwara (2016) also found that ISO 14001 has improved firm's environmental performance. As pointed by scholar such as Zhu, Sarkis and Lai (2013), environmental performance will lead to other performances. This shows that automotive manufacturers with environmental practice of ISO 14001 and reverse logistics domains of material recycle and green disposal can lead to firm resilience. Theoretically, as environmental issues are critical for firms to address, ISO 14001 adheres to contingency theory connotation that firm need to adapt and fit into the business environment to sustain. That is why, practically, automotive manufacturing firms are adopting ISO 14001 to ensure competitiveness, achieving performances and resilience.

Nevertheless, this study found that firm resilience was not influenced by higher level of ISO implementation due to remanufacturing is deemed unimportant among Malaysian automotive manufacturers for reverse logistics practices. As automotive manufacturers in Malaysia is not ready for remanufacturing practice and not yet reaching full potential of remanufacturing, implementation of ISO 14001 has limited effect on firm's reverse logistics practices to achieve resilience. Perhaps in due time or investment by automotive manufacturing firms to adopt full fledge reverse logistics practices will see automotive firms achieving firm resilience. In addition, in due time when many more automotive manufacturing firms implementing ISO 14001, automotive firms will begin to fully implement ISO environmental management to enhance its performance and distinguish between competitors. Then, the impact of ISO 14001 will begin to show significant results.

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