



# Immediate return in circular economy: Business to consumer product return information sharing framework to support sustainable manufacturing in small and medium enterprises

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## ABSTRACT

SME manufacturers of electrical and electronic equipment seem to have high e-waste levels, which is inhibiting SMEs manufacturers in becoming more sustainable. On the other hand, consumers play a major role in enabling the SMEs manufacturers to achieve their sustainability targets as they are responsible for returning their e-waste back to SMEs. Based on the concepts of social marketing theory, this paper aims to examine the type of information that influences consumers' intention to immediately return their e-waste back to SME manufacturers. A conceptual framework is developed and tested through a survey questionnaire to 394 Malaysian consumers. The relationship of the proposed types of information and information presentation towards consumers' immediate return attitude, as well as environmental motivation and environmental knowledge as the moderators in consumers' segmentation are tested. The findings suggest that specific type of return information and message framing have a positive effect on Immediate Return Intention.

## 1. Introduction

To reintegrate economy within ecological limits, the social and environmental sustainability needs to be enhanced. The gradual rise in environmental consciousness has increased every business's and individual's responsibility to engage in environmental protection effort (Islam et al., 2021; Ofori and Opoku Mensah, 2021). Advocates perceive that the individual environmental concerns should also be reflected in their disposal habit (Pérez-Belis et al., 2015; Ahmad et al., 2020). However, the actual practice in the disposal habit is not as satisfactory as it should be (Richter et al., 2021). While consumers have shown a gradual growth trend in environmental awareness, their environmental

behaviour in terms of returning the used products has not increased (Shan et al., 2021). Recent research attempted to investigate the factors influencing consumers' willingness and participation in Product Return and Recovery Management (PRRM)<sup>1</sup>, such as convenience (Wagner, 2013; Ambilkar et al., 2021), attitudes (Milovantseva and Saphores, 2013; Aćimović et al., 2020), financial incentives (Gunasekaran et al., 2015; Ullah and Sarkar, 2020) and environmental education (Pérez-Belis et al., 2015; Ambilkar et al., 2021). However, existing studies lack in exploring solutions for the immediate return of used products back to SME manufacturers (e.g., Caldera et al., 2019). Immediate return back to SME manufacturers after the consumption phase is important to grant optimal recovery value of durable products and generally, and to

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<sup>1</sup> Please refer to Appendix Table A for the list of abbreviations.

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minimise the negative environmental impacts (Mathu, 2021; Ofori and Opoku Mensah, 2021).

To solve stockpiling or storage behaviour of used products among consumers of electric and electronic appliances (i.e., e-waste) such as laptops, phones, and other small electric appliances, it is important to communicate the ideal timing of return, and the acceptable quality of return (Ismail and Hanafiah, 2020). In the current marketing and promotion practices of green and/or 'ordinary' products, SME manufacturers tend to state the product's benefit, as this positive information is used to influence the consumers in the target market in their purchasing decision and enhancing their green environmental protection awareness (Eisend, 2006; Meng et al., 2021). For example, green products will convey the message of how it will help in environmental pollution reduction and how it helps to decelerate climate change and global warming (Rehman et al., 2021; Zhang and Ma, 2021). All these marketing messages; however, do not inform consumers about the negative impact of the products on the environment if they are not properly disposed after their End-of-Life [EoL]/End-of-Use [EoU] phases. Therefore, the appropriate information to achieve the return of e-waste of consumers still needs to be clarified. Environmental information sharing is explored to identify the way of conveying the message in how product return should be practiced; considering the right time to return the used products, the standard of acceptable quality of return and the right quantity of return. Thus, more research is needed to explore the Immediate Return Intention (IRI) among consumers in EoL/EoU. IRI refers to consumers tendency to recycle electronic products when they no longer serve their initial purpose, e.g., a laptop that cannot be repaired but the consumer still stores it (Assaker et al., 2011).

Several advocates still voice their concerns that SME manufacturers are not able to adopt and implement green practices, mainly, in the developing regions (Karuppiah et al., 2020). Despite that, SME manufacturers demonstrate ongoing efforts in having a positive environmental impact while maintaining profitability (Dey et al., 2019). One of these efforts is by transforming linear economy to adopting Circular Economy (CE) principles and implementing the take-make-distribute-use-recover model to replace the linear business models and strategies (Hopkinson et al., 2018; Sharma et al., 2020). CE requires a systemic transformation in the whole structure of an economy. However, evidence suggests that benefits seek to outweigh the costs incurred during the adoption of CE practices (Patwa et al., 2021). Based on CE principles, products, materials, and resources should remain in the circulation for as long as possible, while reducing waste generation (Bovea and Pérez-Belis, 2018; Mangla et al., 2021). To bring positive environmental impact, manufacturers started to incorporate Reverse Logistics (RL) into their production strategies to support recover, repair, reuse and remanufacturing of the materials and products. These green manufacturing practices help in extending products, materials, and resources useful life. In these efforts, cooperation from all stakeholders in the supply chain; forward and backward is of high priority. This includes cooperation from consumers, which is critically important to ensure the successfulness of manufacturers' circular business model (Luthra et al., 2022). This is because consumers are directly responsible for the different decisions that affect the end of the useful life of products (Gurauskienė, 2008).

The IRI among consumers in EoL/EoU phases is crucial for enabling SME manufacturers in achieving their sustainability targets for the following reasons: (a) the action of immediately returning any used electric and electronic products (e-products) can extend a products', materials and resources' useful life and therefore it will enable the e.g., repair, reuse and remanufacturing practices of SME manufacturers, (b) IRI is feasible shift of paradigm in consumers' disposal behaviour, with the assumption that it is aided by the inclusion of relevant information about EoL/EoU return, and (c) IRI is a new research area, especially without the economic factors i.e., monetary incentives and discount to encourage proper disposal of e-waste. Extant research studies have considered the obstacles in the product return management in the

manufacturing sector (e.g., Zailani et al., 2017), the extent to which product returns motivate manufacturing firms to adopt closed-loop supply chain activities (e.g., Shaharudin et al., 2017), and the prediction of the product return volume through machine learning techniques (Chui et al., 2020). There are only a few studies examining the factors that affect consumers participation in the recycling process of electronic products. Jena and Sarmah (2015) examined these factors and suggested that return intention is positively influenced by the perceived benefit and social awareness, whereas negatively influenced by the perceived risk.

Whereas Kianpour et al., (2017) suggested that consumers product return intention is risk associated with EOL electronic products, and consumers' ecological knowledge. However, these studies did not consider the message framing and its effect on immediate return intention with the effect of Environmental Motivation (EM) and Environmental Knowledge (EK). Better understanding of the message framing aspect could suggest to manufacturing SMEs the exact aspects that need to be improved in their products information to encourage consumers participation. IRI is a behavioural paradigm that emphasizes the immediate return of e-waste to SME manufacturers. Despite the significant research on the factors that affect IRI, there is still lack of substantial discussion on IRI among consumers and between SME manufacturers and consumers. Considering IRI as the intended behavioural paradigm and information as the driver, this paper seeks to answer the following research question:

**RQ:** *What type of information influences consumers' intention to immediately return their e-waste back to SME manufacturers?*

In order to address the aforementioned research question, the theoretical lens of social marketing theory is utilised. Social marketing theory aims to change people's behaviour and to inform or educate them about social problems. Hastings and Saren (2003) in their work on marketing theory, examined the synergetic connection between social, commercial, and critical marketing assumption. They argued that social problems are reason for changes in human behaviour and making use of social marketing theory, the problem of social behaviour can be addressed. On the other hand, Rundle-Thiele et al., (2019) noted that environmental, health, and social change – individually as well as collectively – are complex problem(s) that need to be addressed. They further argue that new evaluation approaches are needed that assess individual and structural changes. In doing so, they proposed a ten social marketing theory development goals categorised in three groups: (a) research design, (b) building social marketing theory, and (c) methodological innovation, in order to support social marketers to influence change. However, in this paper, social marketing theory is used to underpin the introduction of the concept of IRI, as the intended behavioural change. Hence, the aim of this research is to examine the type of information that influences consumers' intention to immediately return their e-waste back to SME manufacturers based on social marketing theory.

### 1.1. Knowledge gap and research contribution

In this study, using the theoretical support of social marketing, PRRM, IRI, IRA, and awareness among consumers are take into consideration to address the above-mentioned research question. The literature confines their analysis to PRRM while there is lack of exploration of immediate return back to SME manufacturers after EoL/EoU. Empirical research on negative impact of improper disposal after EoL/EoU is scant. In particular, clarifications of appropriate framework for information-sharing and immediate return mechanism to succeed the collection of e-waste of consumers after EoL/EoU are the knowledge gaps in the extant literature. Additionally, there is lack of studies on linkages among the antecedents of consumer participation in recycling of e-waste. Furthermore, there is lack of studies on relationship among MF, IRI, EM, and EK in the e-waste management after EoL/EoU. Moreover, the studies on types of information affecting IRI and IRA of

consumers, right time of return and acceptable quality of return of e-waste are overlooked in literature. To fill the knowledge gaps, a conceptual framework of information-sharing is proposed and empirically validated. This research has embedded and empirically validated the concept of social behavioural areas in social marketing theory and explored the understanding of role of consumers in CLSCs for sustainable development. The proposed framework can be instrumental in improving the cost efficiency and sustainable performance of the SME manufactures.

The paper is organised as follows. The paper starts in [Section 2](#) with the theoretical background of this research. [Section 3](#) discusses the hypotheses and the conceptual framework of this research. [Section 4](#) presents the methodology and the scale validation, while [Section 5](#) presents the findings. Then the discussion of the results and the research implications are in [Section 6](#). The paper concludes with the implications to theory and practice as well as the future research directions.

## 2. Research background & related work

### 2.1. Information in product return and recovery management (PRRM)

The rapid consumption of electronic devices and products and equally lack of specific return information has created many challenges in linear economy to manage e-waste ([Sharma et al., 2020](#)). This significant growth of durable household waste may further be intensified by a reduction of the useful life of existing devices driven by the ever-faster release of products with new features ([Saphores et al., 2012](#)). To amplify the return initiated by consumers, awareness is vital. According to [Jena and Sarmah \(2015\)](#), to spread awareness among the consumers for returning their used products is a challenging task for SME manufacturers. Nonetheless, this issue is challenging yet possibly attainable. It is achievable with the support of adequate and accurate information throughout educational programs and campaigns, plus the familiarity of general EK among consumers ([Liobikienė and Poškus, 2019](#)). Since today's consumers appreciate general EK more than ever, the distribution of this type of specific EK is possible. [Guide and Van Wassenhove \(2009\)](#) investigated the evolution of Closed Loop Supply Chain (CLSC), resulting in three sub-processes in the reverse supply chain which contains different information respectively. They highlighted that time and quality are the types of information required in product return management. Businesses use this information to make strategic decisions in implementing the reverse supply chain. According to [Hosoda et al., \(2015\)](#), the manufacturer acquires a product's return information from the remanufacturer to measure the CLSC performance and this information depends on lead times, random yields, and demand as well as returns-related parameters factors.

Considering what it offers to businesses, such as SME (re) manufacturers, this research aims to explore the potential of this type of information in the business-to-consumer information sharing network. This study is intended to contribute to the existing literature by expanding this information into the business-to-consumer information sharing context. To do that, this information will be translated into product return knowledge, which is expected to support the immediate return of e-waste among consumers ([Condemi et al., 2019](#)). For (re) SME manufacturers, this information will be vital to ensure a profitable recovery process, and for consumers, this information will help them to understand why they need to immediately return their durable household waste. To amplify return of e-waste, consumers should also be educated so that they can contribute to ensure human health and well-being and social good, leading to realise circular economy goals ([Condemi et al., 2019](#); [Islam et al., 2021](#)). Therefore, this paper intends to explore the value of this information as consumers' reference to encourage immediate EoL return of electronic and electric products.

### 2.2. Information as the driver

The context of environmental information sharing presented in this paper aims to explain how SME manufacturers could possibly help consumers to obtain the necessary information to return their e-waste. This means that SME manufacturers are responsible for providing relevant and accurate information to consumers and to influence consumers' decision-making in practising the product return behaviour. As for the knowledge requirement concept, it explains consumers' expectation of information availability and presentation. Knowledge requirement is one of the convenience factors suggested by [Wagner \(2013\)](#). Therefore, it is about the convenience in seeking relevant information and it should be available and accessible to consumers. Obtaining necessary information is the decisive point influencing further action by individuals. In the case of encouraging consumers to participate in product return and recovery activities, consumers need to obtain knowledge about how the materials/products can be returned, to what extent separation is required, when collection occurs for curbside collection and for non-curbside collection programs, where, when, and how materials can be dropped off. Additionally, for drop-off site, consumers need to know and identify the process, site, and hours of operation for drop-off sites. Acquiring this kind of information is time-consuming and it could cause demotivation among consumers in practising their pro-environmental behaviour.

According to [Saphores et al., \(2006\)](#), familiarity with the recycling increases consumers' willingness to drop-off e-waste, because individuals do not have to invest time in determining the recycling requirements. Convenience in knowledge requirement is achievable when the necessary information is visible and understandable, and easy to understand. This is same in the case of product return knowledge, which is intended to initiate an immediate return after EoL/EoU phase among consumers. It is the SME manufacturer's responsibility to ensure that this kind of information is available, accessible, and understandable by consumers. To enhance the efficiency of translating this specific environmental information, it is better to consider consumers' acceptance of information content and information presentation ([Taufique et al., 2016](#)).

The discussion of translating specific product return information to an understandable message leads this research to explore the consumer knowledge creation process. The knowledge creation process comes first before the knowledge can be shared ([Oghazi et al., 2018](#)). Consumer knowledge is one of the domains in knowledge management and received relatively little attention; on the other hand, information about ideal timing and acceptable quality of return can be classified as knowledge for consumers ([Khodakarami and Chan, 2014](#)). This category of knowledge is provided to consumers to satisfy their needs. Consumer knowledge is a critical asset, and gathering, managing, and sharing consumer knowledge can be a valuable competitive activity for organisations ([Garcia-Murillo and Annabi, 2002](#)).

## 3. Hypotheses derivation & conceptual framework

### 3.1. Theoretical underpinning: social marketing theory

The proposed hypotheses of this research are underpinned by social marketing theory ([Andreasen, 1995](#)), considering the application of marketing techniques and social change. The focus of social marketing theory is the application of well-known marketing tools and techniques (i.e., marketing mix) to foster social change ([Wymer, 2011](#)). According to [Andreasen \(1995\)](#), social marketing benchmark criteria (e.g., behavioural change, formative research, segmentation, exchange, marketing mix and competition) offer useful guidelines to ascertain the extent that social marketing is employed within a change intervention. The goal of social marketing theory is to change people's behaviour, and not only to inform or educate them about social problems. As for this paper, social marketing theory is used to underpin this exploratory

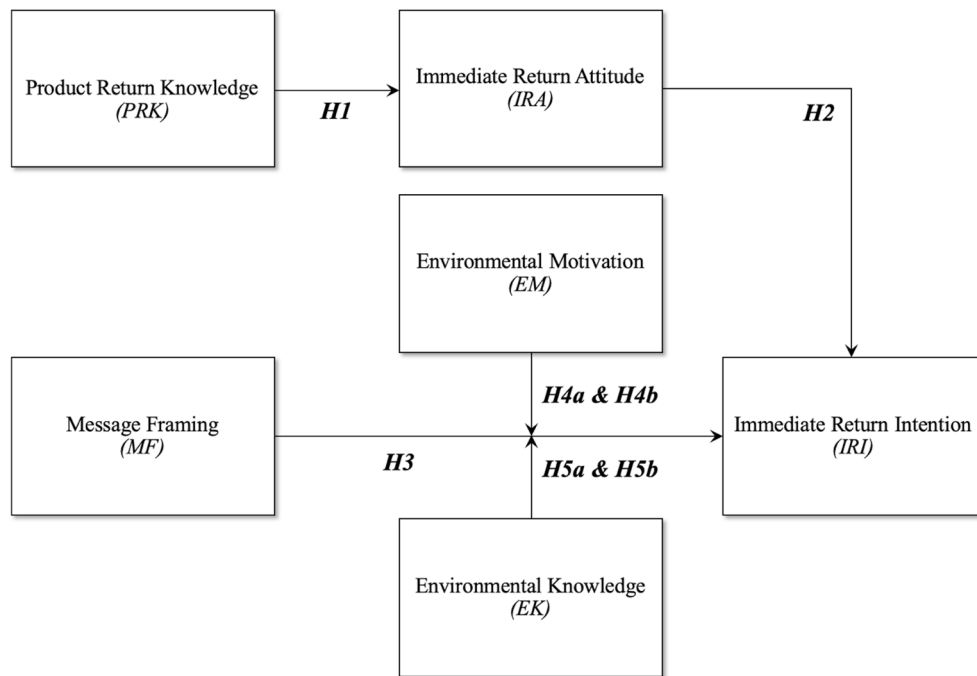


Fig. 1. Proposed Conceptual Framework.

research in introducing the concept of immediate return intention as the intended behavioural change.

The proposed conceptual framework is formulated by using formative research and segmentation criteria. Formative research offers guidelines in understanding consumers' need. In this research, formative research is used to understand the type of information that is valued by consumers, and how consumers want the information to be presented. By identifying this key information, it is expected to encourage consumers' participation in immediate product return activity. As for segmentation, the target audience is categorised according to subsets suggested in the moderator matrix. There will be four segmentations of consumers according to their Environmental motivation (EM) and Environmental knowledge (EK): consumers with high EM, consumers with low EM, consumers with high EK, and consumers with low EK. These different groups of target audiences with different levels of EM and EK, it is assumed to prefer different kind of information presentation. The formative research and segmentation criteria that are applied are important in identifying what people in a specific target group want and need rather than trying to persuade them to adopt what is being offered.

### 3.2. Proposed conceptual framework

The proposed conceptual framework as seen in Fig. 1 covers the aspects of information content (types of information) and information context (the way information is being presented). These aspects belong to two levels of supply chain communication, which are from point of origin (i.e., SME producers or manufacturers) to point of consumption (i.e., consumers). At SME manufacturers' level, the Product Return and Recovery Management takes place to achieve one prime goal: profitable return and recovery operation. Profitable return and recovery mean that the operation achieves operational cost minimisation and profit maximisation. The total cost of reverse logistics includes the costs of collection, inventory, transport, and storage (Srivastava and Srivastava, 2006), while profit maximisation comes from recovery value and consumer purchase. The recovery value from used products may provide a good return on investments (van Hillergersberg et al., 2001). Research recommends that the consumer's waste recycling intentions are

influenced by pro-environmental behaviour, environmental concerns, product return knowledge, and perceived benefits (Deci and Ryan, 1985; Dhir et al., 2021; Shaharudin et al., 2017). Additionally, the method of presenting environmental information and knowledge, Immediate Return Attitude (IRA) and environmental motivation of consumers are important success for encouraging end users to adopt sustainable practices (Avineri and Waygood, 2013; Ballantyne and Packer, 2005; Villacorta et al., 2003). In this study, at consumers' level, EK and EM are selected to be the added contributing factors to modify their current return practice. This means that consumers are willing to commit in immediate return, instead of storing the used products.

The process of translating return and recovery information (information content) into persuasive and understandable context (presentation) is to promote the action of immediate EoL/EoU return among consumers. The identified research gap in this translation process is regarding the right timing of return and acceptable quality of return. This kind of information has not been previously presented in the environmental product information. At present, research about environmental product information available for consumer covers only the environmental effects caused by the products in the phase of manufacturing and use (Jungbluth et al., 2012). Immediate EoL/EoU return is expected to be attainable if consumers are provided with the correct and clear information of product return and recovery. The right information is expected to encourage consumers' willingness to return their used products to the provided drop-off sites, not in domestic waste bins. Consumers need to be educated that used products could have a second life (Jungbluth et al., 2012). When the product return is initiated by consumers, recyclers (SME manufacturers) can cut the cost of curbside collection and minimise the transportation frequency.

The benchmark criteria, formative research, as suggested by social marketing theory (Andreassen, 2002), is used to identify consumer preference towards return and recovery information (time, and quality of return) in product return creation. The identification of relevant product return and recovery information will lead to the process of translating the information into an understandable environmental message format. The rationale of understanding the types of information valued by consumers is to avoid information overload. It is noted that providing a huge number of product information items might result in

an information overload; therefore, it becomes necessary to identify the items consumers especially value (Pieniak et al., 2013). As the information consumers demand might vary between consumer segments, the valued information items also should be determined for different target groups (Verbeke, 2008). Based on this, the proposed framework is considering the segmentation, as one of the fundamental elements suggested in social marketing theory.

### 3.3. Product return knowledge (PRK)

Product return knowledge refers to an individual's knowledge and familiarity with the returning the used products (Shaharudin et al., 2017). It can be measured in terms of objective or subjective knowledge, which is very difficult to separate operationally (Rao and Monroe, 1988). Thus, a composite multiple-scale knowledge on subjective and objective analysis is usually used to measure the return product knowledge as quality, performance, and price (Rao and Monroe, 1988). To fit in the research context, PRK is reworded to measure the idea of returning, location to conduct return activity, and importance of the return activity. In the context of this study, PRK is the result of translating information from product return management in the reverse supply chain. PRK indicates that highlighting specific information about ideal timing and quality of return is important in influencing consumers' further action towards their durable waste. Therefore, for this research, the PRK concept is extended by considering some special features of returned product knowledge such as the availability of used products centre, the recovery processes, and the existence of toxic material in electric and electronic equipment.

There is evidence that general EK is not always a sufficient condition to predict environmentally conscious consumer behavior (Polonsky et al., 2012). This suggests that product specific EK such as environmental labels providing appropriate and accurate information is also an important requirement in allowing consumers to make environmentally conscious and reasoned decisions (Testa et al., 2015). For this reason, consumers need to know about the existence of EK, understand its meaning, and trust the information presented. Based on the above, this research aims to highlight the usage of specific EK, which is PRK as a tool to affect consumers' actions regarding their electric and electronic products disposal.

### 3.4. Immediate return attitude (IRA)

Ballantyne and Packer (2005) suggest that attitude is one of the strong antecedents that could influence peoples' behaviour. In most models on pro-environmental behaviour, attitude is placed as the central variable between EK and behaviour (e.g., Polonsky et al., 2012) where environmental knowledge and pro-environmental attitudes are highly interconnected (Bamberg, 2003). For EK, this research focuses on product return knowledge, whereas, for pro-environmental attitude, this research focuses on immediate return attitude. IRA seems necessary to solve storage behaviour among consumers. Consumers often keep the electronics in storage and do not return them immediately to recyclers after stopping usage (Sabbaghi et al., 2015). In this research, attitude towards the environment is measured in terms of consumers' degree of agreement in the inclusion and availability of relevant information of EoL/EoU return. The main objective of this research is to investigate the trend of consumer attitude toward the storage of used household durable waste and link this attitude to the products return knowledge. Since the focus of this research is on consumers' storage behaviour, the IRA will be measured in terms of consumers' response to the importance of communication, which will provide relevant information for the immediate return of electronic waste. The proposed relevant information is (a) ideal timing and (b) acceptable quality of return. In the context of this research, IRA is defined as an individual's overall behaviour of performing to return their used products. To the best of authors' knowledge, the EoL/EoU reaction of consumers to products return

knowledge has not been studied in the literature before. Therefore, the following hypotheses is derived:

- **H1:** Product return knowledge is positively related to immediate return attitude for consumers e-waste.

### 3.5. Immediate return intention (IRI)

Intention is an individual's planning of action to perform the behaviour and captures the motivational factors that influence the behavioural attitude (Wang et al., 2013). A person's behavioural intention is conjointly determined by attitude and subjective norm, which assists to measure the actual behaviour of a person (Fishbein and Ajzen, 1975). Immediate return intention is a behavioural paradigm that is aligned with the circular economy implementation (Frei et al., 2020). Immediate return is about the course of action in returning the used products promptly right after it achieves the EoL/EoU phase. The used products should not be stored or retained without any action to properly dispose them. The word 'immediate' in this return activity refers to the ideal timing of return, which will lead to the acceptable quality of return. This is highly important as it will contribute to the effective green manufacturing practices, such as reuse and remanufacturing. Immediate return of used products allows (re) SME manufacturers to decide on better segmentation policies and recovery options. Segmentation policies and recovery options are the two approaches used in closed-loop supply chain in 'closing the loop in EoL/EoU strategy. Segmentation policy is how to sort the return items and recovery option is where to send them (Masoudipour et al., 2017). Immediate return plays a vital role in the effectiveness of segmentation. Segmentation policies that decide the number of returns that enter each recovery outlet are usually based on quality of returns (Jeihoonian et al., 2017). Quality of returns decides either the returns should be respectively recycled, remanufactured, or disposed (Maiti and Giri, 2017). Accordingly, consumers move towards better acceptance of remanufactured products and SME manufacturers can effectively practise green manufacturing. This effort will eventually lead to the ultimate social good which is natural resources perseverance. IRI among consumers should be encouraged to adapt to the changing needs and requirements of the circular economy (Frei et al., 2020). Hence, the following hypothesis is derived:

- **H2:** Immediate return attitude is positively related to immediate return intention for consumers e-waste.

### 3.6. Message framing (MF) & immediate return attitude (IRA)

Literature indicates two methods of presenting environmental information and knowledge, i.e., environmental labels (Horne, 2014), and message framing (Chang and Wu, 2015). An environmental label is a visual method that SME manufacturers use to display the environmentally preferable features of a product in the marketplace. As for message framing, scholars define it as a theoretically grounded persuasive communication strategy aimed at promoting perceptions, judgments, attitude, and behavioural changes through the presentation of equivalent appeals. For example, de Velde et al., (2010) report that it is framed either in the context of benefits gained or negative consequences incurred. There are two types of message framing – positively and negatively framed messages. Positively framed messages emphasize the benefits of engaging in the behaviour, whereas negatively framed messages highlight the adverse consequences of not engaging in the behaviour (Gerend and Cullen, 2008). This is similar to the presentation of EoL/EoU return in environmental product information. The message used in communicating the environmental impact of particular products when they are not properly treated and disposed could be presented in positive and negative ways. In this study, consumers' participation in product return activity can be promoted by emphasizing the positive consequences of doing so (e.g., "if you decide to return your no-longer-

used appliances for proper treatment and disposal, you will help the environment”) or the potential negative consequences of not doing so (e.g., “if you decide not to return your no-longer-used appliances for proper treatment and disposal, you will harm the environment”). These two approaches have the same goal i.e., encouraging participation in product return activity.

The promotion of environmental protection is affected by altruistic factors and even social dilemmas. For instance, Avineri and Waygood (2013) examined the message framing of transport-related carbon dioxide (CO<sub>2</sub>) emissions to determine which could increase travellers’ decisions to use a travel program that benefitted the environment. They indicated that social dilemmas exist in information about climate change and environmental issues. The social dilemma is that of an individual who must choose between collective and individual interest. Individuals who do not engage in environmentally friendly behaviour (e.g., cycling, taking public transportation) influence collective interests; in the long run, air pollution will become increasingly serious, but will not directly influence individuals. Conversely, if individuals choose an environmentally friendly form of transportation to protect public interests, they will be inconvenienced, sacrificing personal interests. Thus, choosing to engage in environmentally friendly behaviour is not only altruistic but has the possibility of loss. In other words, when we attempt to persuade people to engage in environmental behaviour, they are already in a situation of loss, and thus, negative messages are more convincing. Based on the above the following hypothesis is derived:

**H3:** A message framing has positive influence on immediate return intention of consumers e-waste.

### 3.6.1. The moderators

This research proposes a framework that presents product return knowledge in two types of message framing; positively and negatively framed, and it investigates the relationship between PRK and consumers’ EoL/EoU IRA. The framework highlights two moderator roles – Environmental Motivation (EM) and Environmental Knowledge (EK). These two moderators will be used to define consumers’ segmentation. Previous literature defines EM as individual’s level of motivation toward environmentally friendly behaviours (e.g., Villacorta et al., 2003). Deci and Ryan (1985) noted that the concept of EM stems from the innate psychological needs for competence and self-determination. Individual practices pro-environmental behaviour for different reasons. Pelletier et al., (1998) identify these reasons; dissatisfaction with the state of the environment, thinking the environmental problem is important, or feeling the need to do something about it. Thus, motivation has been proposed as a means to gain insight into varieties of behavioural persistence (de Young, 1986).

As for EK, scholars define it as general knowledge about environmental issues or problems, such as the problems the earth is now facing (DeChano, 2006). Additionally, Frías et al., (2008) noted that a lack of ability implies that an individual has limited knowledge of or little familiarity with the object of the message or that the message itself is too difficult to understand. Consequently, the knowledge structures necessary to comprehend a message are either not available or not currently accessible. The selection of moderators in this study is based on attributes of intrapersonal level in an individual. According to Frías et al., (2008), individual motivation and ability affect the outcome of message processing. Fewer studies have investigated whether the differences in personal motivation and ability interfere with the emotional reaction of the individual when reading positive and negative messages, and subsequently influence behaviour (e.g., Chang and Wu, 2015). EM and EK are selected as moderators based on the following assumption:

- Where there is a sense of EM and EK (even at very low level), consumers will spend time to read environmental information about products.

The latter statement is based on the Elaboration Likelihood Model according to which an individual’s motivation can be affected by whether a message has personal relevance (Petty et al., 1983). Individuals process information in two different ways, systematically and heuristically (Chen, 1999). The degree of message elaboration, which conditions the route of processing, is in turn influenced by motivation and ability (Frías et al., 2008). When an individual has high EM, a systematic thinking model to deal with the message will be used (Suri et al., 2003). In contrast, when motivation is low, the individual will choose a heuristic processing model to assess a message, depending only on the clues that are easy to deal with and expending less effort (Suri et al., 2003). This is since an individual in a low motivation situation neither takes any special interest in the information offered and nor needs to engage all cognitive resources (Frías et al., 2008). Hence, when the individual exhibits a low degree of EM, the effects of the negativity bias will be much more limited than when he or she displays a high degree of EM. In this case, regardless of whether the message is framed positively or negatively, the individual simply and intuitively read the message. These heuristic rules lead to an attitude which is less durable and less indicative of future behaviour (Frías et al., 2008).

However, when motivation is high, the individual will need to employ a greater proportion of cognitive resources to assimilate the message. Furthermore, if the individual received a negatively framed message, his or her emotions will generate an additive effect, because people have more motivation to avoid a loss than to attain a gain of equal magnitude (Krishnamurthy et al., 2001). Therefore, they will prefer information about potential negative consequences and ways to avoid their occurrence (Chang and Lee, 2009). Consequently, individuals will be more concerned over the message content, and relevance to environmental protection will be processed in more detail when a message is negatively rather than positively framed (Steward et al., 2003). Hence, the negativity bias will exert its influence. Based on this discussion and to achieve the objectives of this research; to examine the two-way interaction effect between message framing and EM, the following hypotheses are proposed:

- **H4a:** High environmental motivation moderates the relationship between message framing and immediate return intention.
- **H4b:** Low environmental motivation moderates the relationship between message framing and immediate return intention.

In addition to EM, this study also considered EK as the moderator. Therefore, this study attempts to achieve this objective; to decide whether positively or negatively framed message is more effective in appealing for electronic waste immediate return (controlled by EM and EK). When an individual with high motivation and more knowledge performs a behaviour, he or she prefers to engage in environmental goals and can select information with higher relevance to his or her needs, and so understanding will be more efficient and with less effort. Hence, the individual will have confidence in his or her ability to perform the specific behaviour and be more likely to rely on internal confidence and make decisions heuristically, as opposed to systematically, which is how those with less experience make decisions (Kidwell and Jewell, 2008). The likelihood of the negativity bias being triggered will be smaller. As the individual already has relatively high EK, he or she can effectively deal with the message. Thus, there is not much difference in pro-environmental behaviour intention whether the message is framed positively or negatively.

On the contrary, an individual with high motivation and low EK is likely to process the given information systematically or thoroughly. Because they are concerned about the environment and have high EM, therefore, he or she carefully attends, evaluates, elaborates, and integrates task-relevant environmental informational inputs, and base their environmental awareness on their understanding of such information. Therefore, the effect of the negativity bias is proposed on the persuasive effectiveness of immediate return intention occurs in

situations with high EM when the individual has little ability to interpret the information. In another words, the negatively framed message is more effective for individual who has high EM and low EK.

- **H5a:** High environmental knowledge moderates the relationship between message framing and immediate return intention.
- **H5b:** Low environmental knowledge moderates the relationship between message framing and immediate return intention.

Based on the literature findings, the effect of message framing; positive and negative framed message, will be assessed in these four subsets: high EM, low EM, high EK, and low EK. Finally, in a condition where EM is low, no matter whether there is high or low EK, there are no differences in IRI of individuals who have received a positively or negatively framed message.

#### 4. Methodology & scale validation

According to Cooper and Schindler (2001), three research designs are identified, namely exploratory, descriptive, and casual or explanatory. To achieve the overall aim of this research, this paper uses exploratory research design as this research area is quite underexplored. The research approach in this paper is divided into two phases - pre- and post-framework development.

##### 4.1. Phase I: Pre-framework development

This phase was carried out to derive the chosen variables from the theoretical and literature standpoint. The exploratory research design was utilised in the primary stage of this research to set the foundations of the information concerning the research problem and generate hypotheses via investigating the literature. At this stage, this research is using inductive exploration approach. Orlikowski and Baroudi (1991) stated that inductive exploration is beneficial to increase understanding of phenomena within the social and cultural context. In this ‘bottom-up’ approach, it begins with specific observations and looks for patterns and regularities to formulate hypotheses that can be further tested. As for specific observation, this research started with reviews on the PRRM subject area. From the reviews, it enabled us to examine the phases in product return and recovery management. At this point, it provided a clear idea on what phase of product return and recovery management that authors need to focus on. Based on the latter, the authors decided to pursue the investigation in the acquisition phase of product return and recovery management. Then, we found patterns and regularities where most of the literature emphasized on impediments of product return and recovery management.

Based on qualitative content analysis, extent research emphasizes that there are two main categories of impediments or barriers for PRRM: internal and external. According to Hillary (2004), *internal barriers* are the impediments that exist in the company itself that impede the adoption of environmental efforts, whereas *external barriers* involve hindrance from outside of firms that disrupt the adoption of circular economy practices within SMEs. For instance, limited understanding of the practical applications and evaluation of tools is a significant barrier (García-Quevedo et al., 2020). The analysis of structured content from 38 high-quality academic journal research published in reputable outlets, 15 internal impediments and 8 external impediments were identified. The qualitative content analysis of 38 studies presented 153 references of internal impediment, whereas 68 references for external impediment. The analysis revealed that the ratio of external impediments exceeds that of internal impediments. In the context of impediments ranking, the qualitative content analysis reveals that the main impediment is consumers’ operational performance due to the difficulty in obtaining the right volume and timing of returned goods to support production. Analysing these impediments leads to explore the cause-effect relationship between consumers’ operational performance and

certainty in returned products. The results from this impediments discovery research were key to prove that the products return uncertainty problem remains unresolved.

##### 4.2. Post-framework development

Orlikowski and Baroudi (1991) stated that a study can be considered a positivist field if evidence of measurable variables, hypothesis testing, formal propositions, and drawing of inferences are founded. In the context of this study, the event of the immediate return of used electric and electronic products is caused by the circumstance of relevant information availability. Hence, a prediction could be made, which led to hypothesis testing and empiricism. This study presents a collection of verifiable empirical evidence, for example, PRK (independent variables), EK and EM (moderator variables) and IRI (dependent variable). All this empirical evidence is supported by theory (social marketing theory). The findings from tested hypotheses will apply the concept of generality. Generality and inferences enable this research to study one target population and the findings could represent the entire population. In the post-framework development phase, this paper applies deductive approach. In the deductive approach, this research starts with hypotheses development followed by the data collection process.

##### 4.3. Questionnaire design

The design of the questionnaire involves a two-phase development. Firstly, two environmental messages were developed. Designing the framing message was the initial task to collect primary data for validation purposes. For instance, two short messages of approximately 150 words, conveying the advantages (message 1: positive frame) and disadvantages (message 2: negative frame) of returning the acceptable quality used products at the right time. To ensure the validity of these messages, initially a focus group was organised, where 10 participants reviewed the information quality presented in two messages. The focus group intended to understand participants’ opinion on the two environmental messages in terms of clarity. The purpose was to identify how participants would interpret the message; either it is positively framed or negatively framed. The results were then compared to the intended outcome. If participants agree that message 1 is positively framed and message 2 is negatively framed, the validation objective is achieved. Besides the validation objective, the focus group was also asked to indicate whether the two messages are ‘*about the same*’, ‘*slightly different*’ or ‘*much different*’. The highest percent in ‘*much different*’ indicator highlighted that the messages are valid to be used for the online survey. Messages post-validation phase included the design of the survey that completed by six influential measures.

A focus group was conducted with 10 participants to ensure that the two developed messages contain the same quality of information with different presentation. To collect empirical data, this research opted for the questionnaire survey method. In conducting the survey, the cross-sectional technique is used, where data are collected from a given population’s sample for only one period. Since this research is not aimed to examine the patterns, cross-sectional technique fits the purpose. The survey method is utilised, when gathering data concerning behaviour, it intended to address the respondents’ feelings and points of view more specifically.

The questionnaire consisted of close-ended questions, with multiple choice and 7-point Likert-scale measurement. All the measures in this study were adapted from the extant research e.g.: Product Return Knowledge (Jena and Sarmah, 2015), Immediate Return Attitude (Wu et al., 2014), Immediate Return Intention (Parajuly et al., 2017), Message Framing (Chang and Lee, 2009), Environmental Motivation (Pelletier et al., 1998), and Environmental Knowledge (Taufique et al., 2016). To measure the latter, construct the EM index was calculated based on the score of all six subscales in Motivation towards Environment Scale (MTES). The questions on basic EK were derived from the

**Table 1**  
Respondents' Demographic Information.

| Socio-Demographics/Items | Total n = 392 | %    |
|--------------------------|---------------|------|
| Gender                   |               |      |
| Male                     | 156           | 39.8 |
| Female                   | 236           | 60.2 |
| Age                      |               |      |
| 20–29 years old          | 104           | 26.5 |
| 30–39 years old          | 227           | 57.9 |
| 40–49 years old          | 43            | 11   |
| 50+ years old            | 18            | 4.6  |
| Qualification            |               |      |
| High School              | 98            | 25   |
| College/University       | 169           | 43.1 |
| Graduate School          | 125           | 31.9 |

survey administered by the National Environmental Education and Training Foundation (NEETF) and the Roper Group. The close-ended with multiple choices is the best way to calculate respondents' score (DeChano, 2006). Their proficiency was measured based on their score of the correct answer. Respondents' answers were later compared to the answer scheme provided by Roper Group. There were no modifications made on the questions. NEETF set the proficiency criterion at 75 percent correct. Before conducting the main survey, a pre-test was conducted, and the questionnaire was deployed to 30 participants to test its appropriateness and clarify to the surveyed sample. Taking the suggestion of the participants, the final questionnaire was prepared for the data collection. The final questionnaire is divided into four parts, i.e.,

- **First Part** – This part of the questionnaire consists of the questions related to respondents' profile information such as sex, age, education and experience of return of used products.
- **Second Part** – This part is about respondents' environmental profile which measures their current EK and EM.
- **Third Part** – This part includes a seven-point Likert scale, ranging from 'Strongly disagree' (1) to 'Strongly agree' (7), related to various constructs of information content in return product knowledge.
- **Fourth Part** – This is about the post-manipulation measures, which includes a seven-point Likert scale, ranging from 'Strongly disagree' (1) to 'Strongly agree' (7), related to how true, objective, convincing, relevant, believable, useful and interesting the messages are. The last part also includes the five-point scale, ranging from 'always willing' to 'never willing', related to participants' intention to partake in EoL/EoU return if the proposed information is available in the future.

4.4. Data collection and sampling

The final data of the survey questionnaire was collected online using Google forms. The URL of the questionnaire was shared through social media platforms (i.e., Facebook, Instagram, and LinkedIn) and also through individualised emails. This research targeted Malaysian households who own small electric and electronic equipment such as rice cooker, phones, printer, blender, radio, as well as battery-operated toys. Convenience sampling was selected as the sampling frame of the target population was not available (Saunders et al., 2012). Convenience sampling was ideal for this research, as it fitted this research scope and enabled us to decide on the size of the available target population and the ease of data collection.

4.5. Demographic information

In total, 417 valid responses were collected. Due to incomplete responses, the number of usable questionnaires was reduced to 392. Table 1 displays the detailed demographic information for the sample of this study. There were 156 males and 236 females. Age of the respondents was classified as 20–29 years, 30–39 years, 40–49 years, and 50+ old years. Most of the sample (57.9%) was between 30 and 39 years

**Table 2**  
Cronbach Alpha's Coefficient of Focus Group (10 Participants) & Short-Survey (30 Participants).

| Part | Cronbach's Alpha |
|------|------------------|
| PRK  | 0.8153           |
| IRA  | 0.7961           |
| IRI  | 0.8125           |

**Table 3**  
Cronbach Alpha's Coefficient of Main Survey Questionnaire.

| Part | Cronbach's Alpha |
|------|------------------|
| PRK  | 0.8052           |
| IRA  | 0.7898           |
| IRI  | 0.8117           |

old. Education was grouped into three categories: high school, college/university, and graduate school; approximately 43.1% of the respondents were graduated from college or university.

4.6. Reliability analysis

This section presents the reliability analysis results for the questionnaire used to collect the data from the targeted respondents. The coefficient values reported in Table 2 and Table 3 is comparable and can be concluded that the full-scale questionnaire has a good level of internal consistency, thus reliable to be used for the data collection process.

As for other parts of the questionnaire, EM and informative measures were adopted from the previous studies. For example, EM's elements and scale is adopted from Motivation towards Environmental Scale (MTES) by Pelletier et al., (1998). The internal consistency of the MTES subscales appears adequate (0.79 < Cronbach's a 0.89) (Pelletier et al., 1998).

4.7. Confirmatory factor analysis (CFA)

This research uses Cronbach's scores and Composite Reliability Index (CRI) of each sub-construct to conduct CFA<sup>2</sup> (Fornell and Larcker, 1981). It is observed that the CRI of all the six constructs exceeds the threshold value of 0.6 (Bagozzi, 1983) and Cronbach's alpha exceeds the recommended value of 0.7 (Nunnally & Bernstein, 1994). This indicates acceptable internal consistency of the data. As for convergent validity, the Average Variance Extracted (AVE) was used to analyse the measurement scales of constructs. The AVE values of construct exceed the recommended value of 0.5 (Fornell and Larcker, 1981). Standardised item loadings for all were greater than 0.5 and significant <0.001, indicates good convergent validity (Carbonell and Rodriguez, 2006) as presented in Table 4. Here, squared multiple correlations indicated that the percentage of construct variable is explained by the indicators.

Finally, the discriminate validity was evaluated in terms of the average variance extracted (AVE) as shown in Table 5. It is observed that AVE for each construct or latent reflective constructor (average variance shared between the shared construct and its indicators) was greater than the square of the estimated correlation between constructs indicating discriminate validity (Hair et al., 2010). All the diagonal values exceeded the inter-constructed correlations and therefore, the results confirm that the instruments are satisfactory to construct validity. The result of the overall goodness-of-fit was evaluated by applying the  $\chi^2$  test. The

<sup>2</sup> Before the CFA analysis, EFA is done to explore data, which provides information suggesting empirically how many factors are needed to represent that data. The result and dissuasion on EFA is mentioned in the Appendix (Table B).



**Table 4**  
Convergent Validity and Construct Reliability.

| Construct | Item            | Standardised Loading/ Weight | t-value   | Squared Multiple Correlation | Composite Reliability | AVE   | Cronbach's $\alpha$ |
|-----------|-----------------|------------------------------|-----------|------------------------------|-----------------------|-------|---------------------|
| PRK       | PRK_store       | 0.673                        |           | 0.715                        | 0.647                 | 0.615 | 0.8052              |
|           | PRK_harm        | 0.729                        | 9.163***  | 0.613                        |                       |       |                     |
|           | PRK_return      | 0.751                        | 7.482***  | 0.342                        |                       |       |                     |
|           | PRK_dispose     | 0.735                        | 8.290***  | 0.543                        |                       |       |                     |
|           | PRK_recycle     | 0.421                        | 13.732*** | 0.751                        |                       |       |                     |
|           | PRK_effort      | 0.462                        | 16.772*** | 0.736                        |                       |       |                     |
| IRA       | IRA_important   | 0.783                        |           | 0.379                        | 0.761                 | 0.580 | 0.7898              |
|           | IRA_support     | 0.619                        | 15.355*** | 0.572                        |                       |       |                     |
|           | IRA_promote     | 0.451                        | 9.725***  | 0.734                        |                       |       |                     |
|           | IRA_check       | 0.698                        | 12.190*** | 0.651                        |                       |       |                     |
| MF        | MF_true         | 0.711                        |           | 0.521                        | 0.779                 | 0.654 | 0.7661              |
|           | MF_objective    | 0.782                        | 7.419***  | 0.748                        |                       |       |                     |
|           | MF_convince     | 0.725                        | 16.014*** | 0.629                        |                       |       |                     |
|           | MF_relevant     | 0.719                        | 6.514***  | 0.492                        |                       |       |                     |
|           | MF_believable   | 0.751                        | 9.221***  | 0.751                        |                       |       |                     |
|           | MF_useful       | 0.693                        | 6.612***  | 0.313                        |                       |       |                     |
| IRI       | IRI_interesting | 0.641                        | 6.518***  | 0.686                        | 0.885                 | 0.795 | 0.8117              |
|           | IRI_choose      | 0.571                        |           | 0.319                        |                       |       |                     |
|           | IRI_retain      | 0.613                        | 13.715*** | 0.270                        |                       |       |                     |
|           | IRI_effort      | 0.827                        | 7.228***  | 0.911                        |                       |       |                     |
| EM        | IRI_willing     | 0.812                        | 10.019*** | 0.754                        | 0.869                 | 0.519 | 0.8143              |
|           | EM_intrinsic    | 0.512                        |           | 0.529                        |                       |       |                     |
|           | EM_integrated   | 0.694                        | 10.533*** | 0.535                        |                       |       |                     |
|           | EM_identified   | 0.723                        | 36.228*** | 0.795                        |                       |       |                     |
|           | EM_introjected  | 0.614                        | 9.705***  | 0.818                        |                       |       |                     |
|           | EM_externally   | 0.608                        | 10.881*** | 0.947                        |                       |       |                     |
| EK        | EM_amotivated   | 0.812                        | 16.650*** | 0.916                        | 0.763                 | 0.593 | 0.7397              |
|           | EK1             | 0.632                        |           | 0.795                        |                       |       |                     |
|           | EK2             | 0.526                        | 9.528**   | 0.843                        |                       |       |                     |

**Table 5**  
Analysis of Discriminant Validity.

|     | PRK   | ARI    | MF    | IRI   | EM    | EK    |
|-----|-------|--------|-------|-------|-------|-------|
| PRK | 0.948 |        |       |       |       |       |
| IRA | 0.358 | 0.642  |       |       |       |       |
| MF  | 0.197 | -0.397 | 0.491 |       |       |       |
| IRI | 0.079 | 0.153  | 0.256 | 0.849 |       |       |
| EM  | 0.282 | -0.092 | 0.317 | 0.632 | 0.805 |       |
| EK  | 0.175 | -0.251 | 0.503 | 0.429 | 0.793 | 0.930 |

measurement model yielded  $\chi^2$  value of 798.5 with 341 degrees of freedom. The ratio of  $\chi^2$  to df was 2.342, which is lower than the suggested cut off value 5 (Hair et al., 2010). In addition, the results of the goodness of fit measure support the proposed model (IFI = 0.921, CFI = 0.920,  $\chi^2/df = 2.342$ ; RMSEA = 0.062). RMSEA, CFI and IFI also satisfied the recommended value. RMSEA is an effective measure in evaluating the overall fit and proposed value of RMSEA supports the recommended value. Thus, there is a normal fit between the model and observed data.

**5. Findings**

The conceptual framework of this research proposed nine hypotheses to be tested, out of which eight are supported (H1, H2, H4, H4a, H4b, H5, H5a and H5b) and one i.e., H3 is not supported.

**Table 6**  
Model Summary for H1.

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimation | Change Statistics |          |     |     |               |
|-------|-------------------|----------|-------------------|------------------------------|-------------------|----------|-----|-----|---------------|
|       |                   |          |                   |                              | R Square Change   | F Change | df1 | df2 | Sig. F Change |
| 1     | .789 <sup>a</sup> | 0.617    | 0.606             | 1.04347                      | 0.617             | 459.835  | 1   | 392 | 0.000         |
| 2     | .783 <sup>b</sup> | 0.613    | 0.610             | 1.03832                      | 0.006             | 3.964    | 1   | 391 | 0.000         |

a: Predictors: (Constant), PRK\_Time.  
b: Predictors: (Constant), PRK\_Quality.

**Table 7**  
Coefficients for H1 Models.

| Model* |             | Unstandardised Coefficients |            | Standardised Coefficients<br>Beta | t      | Sig.  |
|--------|-------------|-----------------------------|------------|-----------------------------------|--------|-------|
|        |             | B                           | Std. Error |                                   |        |       |
| 1      | (Constant)  | 0.594                       | 0.137      |                                   | 4.327  | 0.000 |
|        | PRK_Time    | 0.960                       | 0.045      | 0.779                             | 21.444 | 0.000 |
| 2      | (Constant)  | 0.543                       | 0.139      |                                   | 3.903  | 0.000 |
|        | PRK_Time    | 0.808                       | 0.089      | 0.655                             | 9.125  | 0.000 |
|        | PRK_Quality | 0.172                       | 0.086      | 0.143                             | 1.991  | 0.047 |

\*Dependent Variable: Attitude.

**5.1. Findings of hypotheses testing**

**5.1.1. Product return knowledge (PRK) and immediate return attitude (IRA) (H1)**

As discussed earlier, Product Return Knowledge is a socioeconomic factor that may have a positive impact towards individual's pro-environmental behaviour. The construct 'knowledge' is meant to measure consumers' familiarity with the functional aspects of environmental message (Taufique et al., 2014) and the meaning of different terms used in. Based on this, for this research scope, return product knowledge is an individual's knowledge and familiarity about retuning the used products. The independent variable for this hypothesis is PRK, with its components, which are ideal timing and acceptable quality. The

**Table 8**  
Models Summary for H2.

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimation | Change Statistics |          |     |     |               |
|-------|-------------------|----------|-------------------|------------------------------|-------------------|----------|-----|-----|---------------|
|       |                   |          |                   |                              | R Square Change   | F Change | df1 | df2 | Sig. F Change |
| 1     | .914 <sup>a</sup> | 0.844    | 0.845             | 0.60703                      | 0.036             | 74.233   | 1   | 392 | 0.000         |
| 2     | .921 <sup>b</sup> | 0.857    | 0.856             | 0.57889                      | 0.014             | 30.600   | 1   | 391 | 0.000         |
| 3     | .924 <sup>c</sup> | 0.861    | 0.859             | 0.57168                      | 0.004             | 8.507    | 1   | 390 | 0.004         |
| 4     | .925 <sup>d</sup> | 0.864    | 0.862             | 0.56666                      | 003               | 6.257    | 1   | 389 | 0.013         |

a: Predictors: (Constant), ATTITUDE\_importance.

b: Predictors: (Constant), ATTITUDE\_importance, ATTITUDE\_support.

c: Predictors: (Constant), ATTITUDE\_importance, ATTITUDE\_support, ATTITUDE\_promotion.

d: Predictors: (Constant), ATTITUDE\_importance, ATTITUDE\_support, ATTITUDE\_promotion, ATTITUDE\_willing.

e: Dependent variable: Immediate Return Intention.

dependent variable for this hypothesis is the mean of ATTITUDE. Table 6 presents a regression analysis between PRK and its components with attitude towards return information (ATTITUDE). The regression results support H1.

- **Model 1** indicates ideal timing as a significant predictor of attitude towards return information,  $R^2 = 0.617$ ,  $R^2 \text{ adj.} = 0.606$ ,  $F(1,392) = 459.835$ ,  $p < .001$ . This model accounted for 61.7% of the variance in attitude towards return information.
- **Model 2** indicates ideal timing and acceptable quality as significant predictors of attitude towards return information,  $R^2 = 0.613$ ,  $R^2 \text{ adj.} = 0.610$ ,  $F(1,391) = 3.964$ ,  $p < .001$ . This model accounted for 61.3% of the variance in attitude towards return information. Table 7 presents the bivariate and partial correlations coefficient between predictors and the dependent variable.

The results shown in Table 7 indicate that consumers with good PRK will positively respond to any available information regarding the immediate return. In line with the initial prediction, both type of information, the ideal timing of return and the acceptable quality of return should be included to spread the knowledge of immediate return. The timing and quality of return are found to be the good predictors and accounted for 61.3% of the variance in attitude towards return information.

5.1.2. Information return attitude (IRA) and immediate return intention (IRI) (H2)

For the relationship between ATTITUDE and IRI, the analysis was conducted by using stepwise multiple regression analysis, in order to identify the constructs affecting consumers' IRI. The independent variable in this relationship is the construct – IRA. The dependent variable is the statistical mean of IRI variable. Table 8 shows the regression result of four predictive models that clearly support H2.

- **Model 1** indicates that consumers appreciate the importance of return to be available in order to encourage the intention of immediate

**Table 9**  
Statistical result for message framing and Immediate Return Intention.

| Immediate Return Intention Statement  | Framed Message | M    | SD    | Mean Differences | 95% of Confidence Interval of the Difference                                   |          | Sig.(2-tailed) | t(390) |
|---|----------------|------|-------|------------------|--|----------|----------------|--------|
|   |                |      |       |                  | Lower  | Upper    |                |        |
|   |                |      |       |                  | <i>When there is a choice, I always choose to properly dispose my e-waste.</i> | Positive |                |        |
|   | Negative       | 5.45 | 1.803 |                  |  |          |                |        |
| <i>I no longer want to retain the e-waste in my house.</i>  | Positive       | 3.68 | 1.832 | -0.116           | -0.832   | 0.401    | 0.451          | -0.498 |
|   | Negative       | 3.00 | 1.348 |                  |  |          |                |        |
| <i>I will make every effort to immediately return my e-waste.</i>                                       | Positive       | 3.90 | 1.921 | -0.431           | -1.195   | 0.332    | 0.265          | 1.122  |
|   | Negative       | 4.33 | 1.748 |                  |  |          |                |        |
| <i>I am willing to drop small e-waste (such as rice cooker, kettle) in designated recycling centre.</i> | Positive       | 3.73 | 1.830 | -0.603           | -1.385   | 0.068    | 0.067          | 1.687  |
|   | Negative       | 3.73 | 1.830 |                  |  |          |                |        |

return. The statistical result shows  $R^2 = 0.844$ ,  $R^2 \text{ adj.} = 0.845$ ,  $F(1,392) = 74.233$ ,  $p < .001$ . This model accounted for 84.5% of the variance in immediate return intention.

- **Model 2** indicates that consumers support the idea to make the return information available for consumer reference in order to encourage the intention of immediate return. The statistical result shows  $R^2 = 0.857$ ,  $R^2 \text{ adj.} = 0.856$ ,  $F(1,391) = 30.600$ ,  $p < .001$ . This model accounted for 85.6% of the variance in immediate return intention.
- **Model 3** indicates that importance to promote immediate return practice through by using relevant information. The promotion of the practice can be used to amplify the intention of immediate return. The statistical result shows  $R^2 = 0.861$ ,  $R^2 \text{ adj.} = 0.859$ ,  $F(1,390) = 8.507$ ,  $p < .001$ . This model accounted for 85.9% of the variance in immediate return intention.
- **Model 4** indicates that consumers' willingness to check for return information as a strong indicator for their immediate return intention of used electric and electronic appliances. The statistical result shows  $R^2 = 0.864$ ,  $R^2 \text{ adj.} = 0.862$ ,  $F(1,389) = 6.257$ ,  $p < .001$ . This model accounted for 86.2% of the variance in immediate return intention.

The analysis of H2 shows that positive attitudes towards return information will affect the immediate return intention among consumers, therefore H2 is supported. This result highlights the importance of return information availability, supporting the introduced idea, the promotion of immediate return through relevant information and consumers' willingness to check for the information as strong indicators

**Table 10**  
Group Statistics for Respondent with HIGH Environmental Motivation.

|     | Message Framing | N   | Mean  | Std. Deviation | Std. Error Mean |
|-----|-----------------|-----|-------|----------------|-----------------|
| IRI | Positive        | 144 | 69.44 | 9.856          | 0.068           |
|     | Negative        | 147 | 56.32 | 7.491          | 0.051           |

**Table 11**  
Independent Sample Test.

|     |                            | Levene's Test for Equality of Variances |       | t-test for Equality of Means |        |                 |                 |                       |   |        |       |
|-----|----------------------------|---|-------|------------------------------|--------|-----------------|-----------------|-----------------------|---|--------|-------|
|     |                            | F                                       | Sig.  | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |        |       |
|     |                            |   |       |                              |        |                 |                 |                       |   | Lower  | Upper |
| IRI | Equal variance assumed     | 2.62                                    | 0.012 | 2.093                        | 99     | 0.038           | -0.215          | 0.102                 | -0.422                                    | -0.012 |       |
|     | Equal variance not assumed |   |       | 2.104                        | 85.627 | 0.037           | -0.215          | 0.102                 | -0.421                                    | -0.013 |       |

**Table 12**  
Group Statistics for Respondent with LOW Environmental Motivation.

| Message Framing | N  | Mean  | Std. Deviation | Std. Error Mean |
|-----------------|----|-------|----------------|-----------------|
| IRI Positive    | 53 | 63.47 | 10.653         | 0.201           |
| IRI Negative    | 48 | 53.82 | 8.961          | 0.186           |

to IRI, which accounted for 86.2% of the variance of IRI.

**5.1.3. Message framing (MF) and immediate return intention (IRI) (H3)**

Herein, we investigate the persuasive effect of Message Framing consumers' Immediate Return Intention. As shown in Table 9, statement (a), no significant difference in scores responding to the positively framed message and negatively framed message sig. (2-tailed) column is equal to 0.078 > a; t(390) = 1.617, two-tailed) and the level of difference in the means (mean difference = -0.703, confidence interval = -1.631 to 0.115) is very small (0.03). No significant difference in scores is also found for respondents responding to the positively framed message and negatively framed message for statement (b). Indeed, the value of the sig. (2-tailed) column is equal to 0.451 (>a). t(390) = -0.498, two-tailed), and the level of difference in the means (mean difference = -0.116, confidence interval = -0.832 to 0.401) is very small (0.004). Statement (c) results show that the value of sig.(2-tailed) is equal to 0.265 (>a) and the level of difference in the means (mean difference = -0.431, confidence interval = -1.195 to 0.332) is very small (0.014). Consequently, no significant difference in scores is found for respondents responding to the positively framed message and negatively framed message (t(390) = 1.122, two-tailed). As for statement (d), sig. (2-tailed) value is 0.067 (>a). Subsequently, no significant difference in scores for respondents responding to the positively framed message and a negatively framed message is found (t(390) = 1.687, two-tailed). Moreover, the level of difference in the means (mean difference = -0.603, confidence interval = -1.385 to 0.068) is small (0.014).

These results provide evidence that H3 is not supported. Null hypothesis (H3 = null) is retained, which is message framing has no differences in persuasiveness effect for an immediate return.

**5.1.4. Message framing (MF) and immediate return intention (IRI) moderated by environmental motivation (EM) (H4)**

Both hypotheses H4a and H4b were formulated to investigate whether message framing has different effect on immediate return intention among consumer, moderated by consumers' EM. To conduct this analysis, respondents were divided into two groups according to the

**Table 13**  
Independent Sample Test.

|     |                            | Levene's Test for Equality of Variances |       | t-test for Equality of Means |        |                 |                 |                       |   |        |       |
|-----|----------------------------|---|-------|------------------------------|--------|-----------------|-----------------|-----------------------|---|--------|-------|
|     |                            | F                                       | Sig.  | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |        |       |
|     |                            |   |       |                              |        |                 |                 |                       |   | Lower  | Upper |
| IRI | Equal variance assumed     | 5.621                                   | 0.015 | -1.472                       | 99     | 0.012           | 6.904           | 2.776                 | 1.351                                     | 12.457 |       |
|     | Equal variance not assumed |   |       | -2.219                       | 25.673 | 0.009           | 6.904           | 2.812                 | 1.256                                     | 12.552 |       |

EM index. The EM index is calculated based on the score of all six subscales in Motivation towards Environment Scale (MTES) found by Pelletier et al., (1998). First half of the respondents were assigned to high EM group if their score is 0.5 standard deviation above the mean, whereas the second half of respondents were assigned to low EM group if their score is 0.5 standard deviation below the mean. The independent sample t-test statistical test was conducted to investigate any difference of message framing effects on IRI when it is measured in two groups of EM, high EM, and low EM. The result for high EM group is presented in Table 10 and 11, whereas, for low EM group, the analysis result is presented in Table 12 and 13.

The results in Table 11 indicate that there was a significant difference in IRI between positively framed message and negatively framed message for consumers who have high environmental motivation t(291) = 2.093, p-value = 0.038.

The results in Table 13 indicate that there was a significant difference in IRI between positively framed message and negatively framed message for consumers who have low environmental motivation t(101) = -2.219, p-value = 0.009.

**5.1.5. Message framing (MF) and immediate return intention (IRI) moderated by environmental knowledge (EK) (H5)**

This section presents the statistical analysis for H5. Both hypotheses H5a and H5b were formulated to investigate whether different message framing has different effect on immediate return intention among consumer, moderated by consumers' EK. To conduct this analysis, respondents were divided into two groups according to their score in answering broad-based environmental questions derived from Roper Group assessment on basic environmental literacy (DeChano, 2006) and scale from the 1997 survey administered by the National Environmental Education and Training Foundation (NEETF). Respondents who scored less than 70% (less than seven correct answers) were assigned to low EK group, whereas respondents who scored 70% and more (had seven and more correct answers) were assigned to high EK group. The independent sample t-test statistical test was conducted to investigate any difference of message framing effects on IRI when it is measured in two groups of

**Table 14**  
Group Statistics for Respondent with HIGH Environmental Knowledge.

| Message Framing | N   | Mean  | Std. Deviation | Std. Error Mean |
|-----------------|-----|-------|----------------|-----------------|
| IRI Positive    | 129 | 73.47 | 12.966         | 0.100           |
| IRI Negative    | 136 | 66.56 | 8.5583         | 0.063           |

**Table 15**  
Independent Sample Test.

|     |                            | Levene's Test for Equality of Variances |       | t-test for Equality of Means |        |                 |                 |                       |   |        |       |
|-----|----------------------------|---|-------|------------------------------|--------|-----------------|-----------------|-----------------------|---|--------|-------|
|     |                            | F                                       | Sig.  | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |        |       |
|     |                            |   |       |                              |        |                 |                 |                       |   | Lower  | Upper |
| IRI | Equal variance assumed     | 7.205                                   | 0.009 | 2.478                        | 263    | 0.016           | 6.904           | 2.776                 | 1.351                                     | 12.457 |       |
|     | Equal variance not assumed |   |       | 2.455                        | 49.852 | 0.018           | 6.904           | 2.812                 | 1.256                                     | 12.552 |       |

**Table 16**  
Group Statistics for Respondent with LOW Environmental Knowledge.

| Message Framing | N  | Mean  | Std. Deviation | Std. Error Mean |
|-----------------|----|-------|----------------|-----------------|
| IRI Positive    | 71 | 31.31 | 24.292         | 0.342           |
| IRI Negative    | 56 | 53.54 | 17.873         | 0.319           |

EK, high EK and low EK. The result for high EK group is presented in Table 14 and 15 whereas, for low EK group, the analysis result is presented in Table 16 and 17.

The results in Table 15 indicate that there was a significant difference in immediate return intention between positively framed message and negatively framed message for consumers who has high environmental knowledge  $t(265) = 2.455, p\text{-value} = 0.018$ .

The results in Table 17 indicates that there was a significant difference in Immediate Return Intention between positively Framed Message and negatively Framed Message for consumers who has low Environmental Knowledge  $t(127) = -2.835, p\text{-value} = 0.009$ .

To summarise, six out of seven hypotheses (i.e., H1, H2, H3, H4a and H4b, and H5a and H4b) proposed in this research are supported. Only H3 was not supported due to the empirical findings. H3 was about investigating the persuasive effect of message framing consumers' IRI. No significant difference in scores responding to the different message framing were reported – positively framed message and negatively framed message. Analysis result reported that scores for each statement is very minor. However, the analysis showed different result for other hypotheses of message framing. The analysis result for IRI when jointly predicted by MF and EK, as well as jointly predicted by MF and EM highlight significant result. Table 18 concludes the analysis results.

Main results and findings of nine hypotheses illustrate that eight hypotheses (H1, H2, H4, H4a, H4b, H5, H5a and H5b) are supported and H3 hypothesis is not supported. These findings provide statistically significant evidence that there are positive correlation and relationship between PRK, IRA, EK, EM and IRI. The results also indicate that relationship between message framing and IRI is not significant, i.e., the message framing does not influence the consumers' immediate return intention, but the case changes when the relationship was moderated by EM and EK.

**6. Discussion**

Discussion about the consumer's IRI of the used products is considered as the strongest predictor for the willingness of consumers and

research in this area is missing from the existing literature. This research developed a conceptual framework and empirically tested to examine the intention of consumers to immediately return their used products and to identify whether message framing on the products, as well as environmental motivation and knowledge play a role in that. The significant contribution of this research to the existing literature as follows: *firstly*, this study identified dimensions of IRI by conducting theoretical analysis in EoL and EoU context, *secondly*, this study empirically examined the relationship among PRK and IRI, IRA and IRI, as well as the moderating effect of EM and EK in the MF and IRI relationship. This study adds to the existing studies e.g., Jena and Sarmah (2015) and Kianpour et al., (2017) by indicating that message framing impacts immediate return intention with the effect of environmental motivation and environmental knowledge.

A statistical result from the analysis of H1 shows a positive relationship between product return knowledge and attitude towards return information. The inclusion of ideal timing of return and quality of return in product return knowledge contribute 61.3% of the variance in attitude towards return information. Based on this statistical result, it is relevant to include the very specific type of information (ideal timing of return and quality of return) to initiate positive attitude towards return information. This specific information can influence consumers to be alert of the importance of immediate return, support the idea, and join the promotion of immediate return, and eventually willing to check and read the information and act accordingly. The findings on this relationship are consistent with the findings of Taufique et al., (2016) who found that accurate information and specific information can positively affect an individual's pro-environmental intention and behaviour. Taufique et al., (2017) also reported that the effect of eco-label knowledge is better than the effect of general knowledge to influence someone to perform pro-environmental behaviour.

Moreover, the analysis of the relationship between timing and

**Table 18**  
Overall Hypotheses Testing Results.

|     | Hypotheses         | Result        |
|-----|--------------------|---------------|
| H1  | PRK → ATT          | Supported     |
| H2  | ATT → IRI          | Supported     |
| H3  | MF → IRI           | Not supported |
| H4a | MF → High EM → IRI | Supported     |
| H4b | MF → Low EM → IRI  | Supported     |
| H5a | MF → High EK → IRI | Supported     |
| H5b | MF → Low EK → IRI  | Supported     |

**Table 17**  
Independent Sample Test.

|     |                            | Levene's Test for Equality of Variances |       | t-test for Equality of Means |        |                 |                 |                       |   |        |       |
|-----|----------------------------|---|-------|------------------------------|--------|-----------------|-----------------|-----------------------|---|--------|-------|
|     |                            | F                                       | Sig.  | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |        |       |
|     |                            |   |       |                              |        |                 |                 |                       |   | Lower  | Upper |
| IRI | Equal variance assumed     | 6.562                                   | 0.016 | -2.746                       | 125    | 0.011           | -22.226         | 8.093                 | -38.832                                   | -5.620 |       |
|     | Equal variance not assumed |   |       | -2.835                       | 26.784 | 0.009           | -22.226         | 7.839                 | -38.317                                   | -6.135 |       |

quality of return included in the product return knowledge indicated a strong association with the capability in performing tasks such as checking out any environmental information on the products. Apart from the inclusion of specific information about immediate return, the product return knowledge formulated for this research also emphasized environmental issues. These environmental issues explicitly translated into six statements, which cover the issues of consumers' storing behaviour of used electric and electronic appliances, improper disposal of e-waste and remanufacturing. These issues were highlighted because findings are showing that the amount of knowledge (i.e., system knowledge) alone cannot predict responsible environmental behaviour (e.g., Kaiser and Fuhrer 2003). However, Finger (1994) explained that knowledge about environmental issues – despite its limited impact on environmental behaviour – can be used to combat fear and anxiety and can lead to protest actions. As one of the main objectives of this study, this hypothesis revealed the result that product return knowledge supplements general environmental knowledge in shaping consumer attitudes towards the environment. This study contributes to the existing literature by confirming that in addition to general environmental knowledge, issue-specific environmental knowledge (i.e., product return knowledge) also positively influences environmental attitudes and pro-environmental consumer behaviour.

Previous studies explain and predict the relationship between knowledge and pro-environmental behaviour. For instance, environmental uncertainty will result in greater need of knowledge integration, which can be achieved by greater use of knowledge management. Re-conceptualisation of knowledge is necessary as it will help in educating and modifying behaviours towards environment. As one of the main objectives of this study, this hypothesis revealed the result that product return knowledge supplements general environmental knowledge in shaping consumer attitudes towards the environment. This study contributes to the existing literature by confirming that in addition to general environmental knowledge, issue-specific environmental knowledge (i.e., product return knowledge) also positively influences environmental attitudes and pro-environmental consumer behaviour, which is immediate return of e-waste.

As this study finds significant positive impact of Product Return Knowledge on attitudes toward return information, and subsequently result in more favourable intention in immediate return, marketing communication needs to aim at teaching the consumers. This could be done, for instance, by introducing standardised eco-label that can be referred when they want to dispose the used electric and electronic appliances. The eco-label should clearly tell consumers when they need to return the e-waste to help maximise recovery value of the waste. Furthermore, it may help businesses to develop specific communication genres to communicate with their customers, for example, the introduction of approved and standardise eco-label. This eco-label can be composed by employing consistent use of phrases and organisations to reach consumers' genre conformity, over time. Like any other standardised documents, consumers will be accustomed to this conformity genre as a heuristic cue for authenticity. The operational social marketing approach suggested in this research is seen to have potential in influencing the strategic social marketing strategy and development, which requires strong customer understanding and insight to inform and guide effective policy and strategy development. It will be useful for designers to prepare post-purchase documentation, as well as for organisations, activist and environmental agencies to design environmental message regarding EoL and EoU return.

In terms of the moderating effect of the EM on the MF and IRI relationship, the results suggest that when an individual believes engaging in environmental behaviour is enjoyable, sensible, and enables contribution, and even feels guilty and remorseful when not being pro-environmental, the individual deeply cares about environmental protection and is willing to read and understand messages pertaining to environmental protection. Conversely, when individuals have low EM, they are unimpressed by environmental messages.

Early models explain that knowledge impacts attitude, which in turn leads to pro-environment behaviour (e.g., Kollmuss and Agyeman 2002), whereas Hines et al., (1987) in their meta-analysis found that EK issues (i.e., system knowledge) significantly influenced environmentally responsible behaviour. Tanner and Kast (2003) argued that some sort of appropriate knowledge was necessary for behaviour to occur, and that knowledge is critical to understanding consumer behaviour. The results indicate that message framing does have significant differences in IRI when it is moderated by EM and EK. The findings support the idea that segmentation is vital to effectively disseminate information and knowledge. The segmentation can be segmented in socio-demographics (age, education level, income status, gender) or measurable intrinsic attributes, for example in this research context, EK and EM. Therefore, it is obvious that environmental messages dissemination should consider the concept of segmentation, strongly suggesting that environmental messages should be designed specifically for different segmentations of consumers.

The findings of this study offer managerial insights, such as the inclusion of ideal timing and acceptable quality in product return information, and formulation of relevant marketing communication regarding the immediate return of electric and electronic waste. In another word, this study informs consumers' decision making in altering their product return activity, from return the used products to immediately return their used products. Mugge et al., (2017) reported that providing consumers with information has a positive impact on their decision making. This informed decision-making process would be fundamental in the circular economy as an immediate return by consumer contributes a better inventory of product for post-EoL treatment, in terms of volume and quality.

## 7. Conclusion

This research proposed and empirically tested a conceptual framework that examined how product return information can influence the information processing at consumers' level, so that it is understandable and influential to encourage participation in immediately returning used products to SMEs manufacturers after EoU and EoL phases. The framework was developed based on social marketing theory and empirically tested through a structured survey questionnaire. This research initiated the exploration of Business-to-Business (B2B) related information; ideal timing and quantity of return, into B2C communication and its potential to amplify drop-off recycling. This research also contributes in introducing the concept of IRI, which based on behavioural change, one of the benchmark criteria suggested in the social marketing theory. This research contributes to this growing area of research and practice that seeks to better understand the role of consumers within CLSCs, which is important to the growth of the recovery activity and, subsequently, sustainable development (Altmann, 2015).

### 7.1. Implications to theory and practice

- **Implications to Theory** – Andreasen (2002) developed the original benchmark criteria for social marketing – i.e., behavioural change, consumer research, segmentation and targeting, marketing mix, exchange and competition. Based on these findings, this research validated significant development in social marketing discipline. This research contributes to initial close identification with the marketing of products involved in social change to a broader conception of its potential areas of application. This research applies the marketing strategy of products to a social behavioural area, which is the IRI of e-waste after consumption. In behavioural change, this research proposed and validated the need for an orderly, organised approach to encourage IRI for social goods. The orderly and organised approach that started with the translation process of product return and recovery information into the understandable format of PRK is validated to be one of the factors for the intended

social change, which is IRI. The translation process also considers the criteria of consumer research, which is MF. This research contributes to the inclusion of MF as one of the factors to identify consumer characteristics and needs.

As for further development of the framework, this research is expected to contribute to the inclusion of a new variable of segmentation and targeting. According to [Andreasen \(2002\)](#) segmentation and targeting is using different segmentation variables and there is a need for the strategies to be tailored to the segments. Instead of just using geographic (e.g. cities, countries) or demographic (e.g. sex, age, education), respondents used for this research were categorised based on their EM and EK. For EM, the high and low levels were measured based on an index. The index is developed based on the score for six subscales. As for consumers' EK, the high and low levels are measured based on their proficiency in answering environmental literacy questions. These formulas indicate that intrinsic elements (motivation) and ability (knowledge) are measurable and they are relevant to be used as the basis of segmentation. Varieties in segmentation contribute to the addition of the promotion element in social marketing theory 5P's techniques. Good segmentation strategy may help in promoting a product (or behavioural change) in social marketing campaigns, as segmentation provides a better basis in reaching out interpersonal channel ([Masoudipour et al., 2017](#)). It is expected that this research can contribute new insight in environmental product information development by suggesting the inclusion of important information of product return and recovery management (time and quality of return), which is most valued by SMEs (manufacturers and remanufacturers) for consumers' reference. It will be useful for designers to prepare post-purchase documentations.

- **Implications to Practice:** This research contributes to the practice in SMEs remanufacturing and closed-loop supply chain management. The introduction of IRI concept is believed to be beneficial in supporting the remanufacturing industry and circular economy implementation especially at SMEs level that they are struggling to improve their environmental performance. The awareness among consumers on the need to immediately return their e-waste might be a small contribution to solve the uncertainty problem faced by Original Equipment Manufacturer (OEM) and remanufacturers. When there is an effort to immediately return the e-waste, the SME remanufacturing industry can be beneficial in terms of having good quantity and quality resources to remanufacture the waste and bring it back to the secondary market. This could also be a cost-efficient solution to improve the environmental credentials of SMEs. The IRI concept also purposely minimises unnecessary storage behaviour among consumers.

Minimising unnecessary storage behaviour will then lead to the benefit of amplifying the rate of immediate drop-off (return) activity initiated by consumers. Immediate drop-off activity initiated by consumers creates an economic benefit for consumers, compared to other WEEE collection models; industry-led collection and government-led collection. The common drawback of industry-led collection models is that cost of the collection will eventually be transferred to consumers. This evidently will cause the increment in products retail price which could badly affect consumers' buying power. To avoid the transferred cost, consumers should know how they should respond and take action in product return activity to ensure that there is no hidden cost in their purchases.

The inclusion of ideal timing and acceptable quality information suggested in this research possibly results in an enormous advantage for businesses. Findings from this research area can be used as businesses' investment reference. This will strengthen the need for deploying the right innovative and technological solutions that specifically can support information flow between manufacturers and consumers. It is time for SMEs to consider the 'business-to-consumer' well-configured

platform for information sharing purpose, as an addition to the existing deployment of advanced information and communication technologies that used to support inter-organisational decisions, such as Radio Frequency Identification (RFID), Industry 4.0, Decision Support System (DSS), Artificial Intelligence (AI), Big Data Analytics (BDA), etc. Additionally, as the social networking era emerges, the findings can also help SMEs in further considering social commerce as the new platform for product return information sharing purpose.

In conclusion, the information-sharing framework not only makes a significant theoretical contribution in closed-loop supply chains and consumer disposition literature but is also beneficial for those SMEs that have closed-loop supply chains operations. This research provides SMEs with a framework to review their existing EoL/EoU returns policies, processes, and technology to accelerate, incentivise the returns process, thereby increasing their revenue and profitability along with establishing a strong brand because of green corporate image and corporate social responsibility.

## 7.2. Research limitations and future research recommendations

The authors acknowledge that this study has certain limitations. One limitation could be the purposive sampling approach that was followed, which was not completely random. This perhaps reduces the generalisability of the findings. However, this should motivate additional research to examine additional sample frames and consumer populations to test and extend the results of this study. Furthermore, another limitation revolves around the number of participants. The sample is from a limited population. An ideal study population would contain all potential household with small e-waste. Hence, the household sample used serves only as an approximation. However, selecting a sample comprising all potential household is conceptually difficult.

Despite a considerable body of literature examining many aspects of sustainable manufacturing in SMEs circular economy, B2C product return information sharing, there are still some areas that remain under-explored as given below.

- A longitudinal study that tracks actual purchase behaviours over an extended time would be beneficial for observing and comparing the evolution of the intention – behaviour relationship, given the growing importance of environmentally and socially sustainable practices.
- This research is limited to product return activity of small electric and electronic equipment such as router, rice cooker, printer, battery-operated toys, kettle and blender. For future recommendation, the scope could be expanded to bigger electric and electronic equipment used in household and business premises. Extended research in product return activity from business premises could significantly affect the quantity of returned items.
- The research tested each path of the model separately using OLS regression, future research may test the model simultaneously using SEM techniques.
- This research may contribute new insights on PRK management by suggesting the inclusion of vital information about product return and recovery management (time and quality of return). In the current practice, these kinds of information are available within businesses organisations (manufacturers and remanufacturers), not for consumers' reference. It will be useful for designers to prepare post-purchase documentation, for organisations, activists and environmental agencies to design environmental message regarding EoL/EoU return.
- This research has huge potential in the area of the circular economy. The introduction of immediate return idea could be a small piece in a circular economy puzzle, especially in addressing the issue of natural resources depletion and SMEs remanufacturing practices. Moreover, innovative technologies (e.g. artificial intelligence [AI], Internet of Things [IoT], Big Data Analytics, Blockchains) play a vital role in the

ecosystem as they have the potential to impact both human and organisation processes and behaviours. Future research studies may further explore these emerging technologies and their implications for reverse logistics and EoL/EoU returns policies within the circular economy context.

- This research targeted Malaysian households who own small electric and electronic equipment; however, we propose that further research is carried out in other developing countries at both micro and macro levels (including beyond households). The lessons learnt from these countries will extend CE adoption principles for developing nations. In line with the latter, it will also be prudent to conduct research at the organisational level to understand their EoL/EoU returns policies and circular economy practices in developing and emerging regions.

*CRedit authorship contribution statement*

**Muhammad Mustafa Kamal:** Conceptualization, supporting in writing original draft, review and editing all - initial and revised drafts, and methodology section. **Rosnida Mamat:** Writing – original draft, Conceptualization. **Sachin Kumar Mangla:** Writing - original draft, Writing - review & editing, Conceptualization, Methodology, Supervision. **Patanjal Kumar:** Writing – review & editing, Validation. **Stella Despoudi:** Writing – review & editing, Validation, Methodology, Formal analysis, Conceptualization. **Manoj Dora:** Methodology, Conceptualization. **Benny Tjahjono:** Writing – review & editing.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Appendix A**

See [Table A1](#).

**Table A1**

Table of Abbreviations.

| S. No. | Abbreviations | Full Form/Meaning  |
|--------|---------------|--|
| 1      | SEM           | Small and Medium size Enterprise                         |
| 2      | IRA           | Immediate Return Attitude                                |
| 3      | EM            | Environmental Motivation                                 |
| 4      | EK            | Environmental Knowledge                                  |
| 5      | IRI           | Immediate Return Intention                               |
| 6      | PRRM          | Product Return and Recovery Management                   |
| 7      | EoL           | End-of-Life  |
| 8      | EoU           | End-of-Use   |
| 9      | CE            | Circular Economy   |
| 10     | RL            | Reverse Logistics  |
| 11     | CLSC          | Closed Loop Supply Chain                                 |
| 12     | PRK           | Product Return Knowledge                                 |
| 13     | MF            | Message Framing  |
| 14     | MTES          | Motivation Towards Environment Scale                     |
| 15     | NEETF         | National Environmental Education and Training Foundation |
| 16     | EFA           | Exploratory Factor Analysis                              |
| 17     | KMO           | Kaiser-Meyer-Olkin                                       |
| 18     | CFA           | Confirmatory Factor Analysis                             |
| 19     | CRI           | Composite Reliability Index                              |
| 20     | AVE           | Average Variance Extracted                               |
| 21     | B2B           | Business-to-Business                                     |
| 22     | B2C           | Business-to-Consumer                                     |
| 23     | OEM           | Original Equipment Manufacturer                          |
| 24     | RFID          | Radio Frequency Identification                           |
| 25     | DSS           | Decision Support System                                  |
| 26     | AI            | Artificial Intelligence                                  |
| 27     | BDA           | Big Data Analytics                                       |
| 28     | IoT           | Internet of Things                                       |

**Appendix B**

*Exploratory factor analysis (EFA)*

Before starting the EFA, the Bartlett’s Sphericity Test was conducted to determine the appropriateness of the data for factor analysis and for that, the value of KMO (Kaiser-Meyer-Olkin) was used for measuring adequacy. The value of KMO was found as 0.68, and a significance level of 0.00 was obtained using Bartlett’s Sphericity Test. This test suggested that the inter-correlation matrix contains sufficient common variance to make the factor analysis worthwhile. It is important to note that the

**Table B1**

Exploratory Factor Analysis.

| Construct/Indicator               | Item           | Mean (SD)   | Factor Loading | CPVE  |
|-----------------------------------|----------------|-------------|----------------|-------|
| Product Return Knowledge (PRK)    | PRK_store      | 5.67 (1.11) | 0.725          | 55.77 |
|                                   | PRK_harm       | 4.20 (1.75) | 0.844          |       |
|                                   | PRK_return     | 5.56 (1.35) | 0.800          |       |
|                                   | PRK_dispose    | 4.91 (1.52) | 0.542          |       |
|                                   | PRK_recycle    | 4.44 (1.71) | 0.817          |       |
|                                   | PRK_effort     | 5.38 (1.46) | 0.625          |       |
| Information Return Attitude (IRA) | IRA_important  | 5.59 (1.37) | 0.799          | 36.07 |
|                                   | IRA_support    | 5.67 (1.29) | 0.768          |       |
|                                   | IRA_promote    | 5.60 (1.38) | 0.713          |       |
|                                   | IRA_check      | 4.33 (1.77) | 0.724          |       |
| Message Framing (MF)              | MF_true        | 5.65 (1.32) | 0.682          | 66.16 |
|                                   | MF_objective   | 5.22 (1.57) | 0.650          |       |
|                                   | MF_convince    | 5.56 (1.30) | 0.744          |       |
|                                   | MF_relevant    | 5.26 (1.49) | 0.970          |       |
|                                   | MF_believable  | 5.46 (1.51) | 0.959          |       |
|                                   | MF_useful      | 5.04 (1.70) | 0.957          |       |
| Immediate Return Intention (IRI)  | IRI_choose     | 5.54 (1.64) | 0.644          | 61.54 |
|                                   | IRI_retain     | 6.03 (1.27) | 0.600          |       |
|                                   | IRI_effort     | 5.51 (1.57) | 0.670          |       |
|                                   | IRI_willing    | 6.10 (1.11) | 0.725          |       |
| Environmental Motivation (EM)     | EM_intrinsic   | 5.87 (1.05) | 0.820          | 49.75 |
|                                   | EM_integrated  | 5.43 (1.45) | 0.949          |       |
|                                   | EM_identified  | 5.89 (1.28) | 0.946          |       |
|                                   | EM_introjected | 5.78 (1.31) | 0.949          |       |
|                                   | EM_externally  | 5.63 (1.65) | 0.948          |       |
|                                   | EM_amotivated  | 5.47 (1.46) | 0.820          |       |
| Environmental Knowledge (EK)      | EK1            | 5.03 (1.69) | 0.721          | 57.24 |
|                                   | EK2            | 5.72 (1.27) | 0.623          |       |

minimum acceptable value of KMO is 0.5 (Nunnally, 1978). For EFA, the principal component analysis, with varimax rotation and Eigen value greater than 1 and factor loading greater than 0.4 was also used. For the analysis of items, the adjusted indicator total correlation coefficient less than 0.4 were used as the criterion to delete indicators. From the result, it was found that PRK Quality has the value of indicator-total correlation coefficient 0.215, which is less than 0.4. All items loaded on their respective factors with most of them loading above 0.70 are shown in Table B1. The cumulative percentage of variance explained, experienced by nine factors is 66.16%. To test the normality assumptions underlying the maximum likelihood procedure, all the constructs were tested separately through both box plot and multivariate normality test. The results indicate that data were normally distributed.

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Dr Patanjali Kumar is a Senior Assistant Professor in School of Business, University of Petroleum & Energy Studies, Kandoli Campus, Dehradun. Dr Kumar is also an Editor of Optimal Envelope, Associate Editor of International Journal of Mathematical, Engineering and Management Sciences (IJMEMS) and Vice President of IEOM (Industrial Engineering and Operations Management Society International) New Delhi Chapter, India. Dr Kumar has completed his doctoral degree in the area of Operations Management and Quantitative Techniques from Indian Institute of Management Rohtak. Dr Kumar has a master degree in technology from the Indian Institute of Technology Delhi, India. Dr Kumar has secured all India 4th, 14th, and 19th rank in Graduate Aptitude Test in Engineering (GATE) in the year 2010, 2013, and 2015 respectively. He has completed a bachelor of technology with honours. Dr. Kumar is recipient of many outstanding awards such as Outstanding Teaching Excellence in SCM Award (IEOM Society International), the best research paper award (AGBA Society), and the best performer award (Bhartiya Kalyan Samiti, Varanasi, UP, India). He has also received a silver medal in Textile Technology from Uttar Pradesh Technical University, Lucknow (U.P.). Dr. Kumar has taught at IIM Rohtak, The Northcap University Gurugram, VESIM Mumbai, and GLA University Mathura (India). Dr Kumar has published in leading journals such as Transportation Research Part E, Technological Forecasting and Social Change, Business Strategy and the Environment, Applied Economics, American Business Review, Operations Management Research, Journal of Public Affairs, and so forth. He has presented his research work in various leading conferences. He has also worked on Defense, policing, and public policy projects. He is currently working in the area of Sustainable Supply Chain, Supply Chain Coordination, Innovative Supply Chain, Game Theory, Optimization, Behavioural Operations Management, and Policing Research.

Dr. Stella Despoudi is Lecturer in Operations and Supply Chain Management at the Aston Business School since September 2018. Prior to this Stella has been working for Coventry University and for Loughborough University's School of Business & Economics. She holds a PhD in Operations and Supply Chain Management from Loughborough University's School of Business and Economics. Stella's research expertise lies in the following research areas: food supply chain management, supply chain resilience, severe weather events and climatic changes, emergency logistics, food waste and food sustainability, resource efficiency. Currently she works on a multi-partner projects related to food supply chain resilience, climatic changes, and Industry 4.0 funded from ESRC and other UK funding bodies. She is Teaching Fellow of the Higher Education Academy and member of Production & Operations Management Society, and European Operations Management Association.

Dr Manoj Dora is currently the Director of Collaborative Projects and Outreach at Brunel Business School. He is also heading the Operations & Information Systems Management Group. Manoj has several years of experience in teaching, research and consultancy worldwide. He is the founder of "Circular Food Forum" which brings together academic, industries and policy makers to facilitate dialogue and take forward research agenda. Manoj's areas of specialisations are Sustainable Value Chain and Quality Management with a focus on Lean Six Sigma in the agro-food sector. His research is an innovative application of cross-cutting operations management theories such as Lean and Six Sigma in the agriculture and food sector which will redesign agricultural production as it is today to improve efficiency and eliminate waste and losses. He has been involved in many capacity building initiatives focusing on the circular economy, humanitarian operations, industry 4.0 and food supply chain in Europe, Africa, South America and Asia. At the same time, he has also worked with over 50 SMEs to implement lean principles as part of their operations. Manoj has been successful in acquiring research grants from the World Bank, European Commission (FP7), British Academy, UKIERI, British Council, Newton Fund and several private companies. He is also appointed as a subject expert at the European Commission, ESRC, VINOVA in the field of food research and circular economy. Manoj is two times recipient of "Best Supervisor of the year" award organised by the Union of Brunel students. PhD candidates who are interested in applied research and believe in contributing to society with their research in these areas: #Circular Economy #Sustainable Food #Value Chain #Industry4.0 (#Blockchain, #IoT, #AI) #Lean Management #Humanitarian Operations #Modern Slavery. Please get in touch. He holds a PhD from Ghent University in Belgium. He has received a MA in Economics from Vanderbilt University in the USA supported by International Ford Foundation. He has several publications in the high impact journals and disseminated his research in reputed forum such as TEDx and Cambridge Festival of Ideas at the University of Cambridge.

Prof Benny Tjahjono is Professor of Sustainability and Supply Chain Management and the co-leader of the Sustainable Production and Consumption cluster at the Centre for Business in Society (CBiS). His research track record has been demonstrated by winning a number of research grants from the Engineering & Physical Research Council (EPSRC), Economic and Social Research Council (ESRC), Academy of Medical Sciences (ACMEDSCI), InnovateUK, European Union, overseas funding agencies and directly from the UK industry sectors. He was one of the Principal Investigators and a member of a consortium consisting of seven universities in Europe recently being awarded the Horizon2020 MSCA Innovative Training Network worth €3,995,643 in total, aiming to formulate the service-oriented business for the European Circular Economy. Prof Tjahjono has a vested interest in sustainability and environmental conservation. Over the last five years he has focused his overarching research area on Sustainable Operations and Supply Chain Management, in particular, the exploration of Circular Economy principles in manufacturing processes. He is an engineer by education and has a strong background in contemporary simulation and modelling techniques, including discrete-event simulation, agent-based simulation and system dynamics. He has applied these techniques, amongst others such as Life-Cycle Assessment/Analysis (LCA), in addressing sustainability issues in modern factories, by proposing an environmentally-conscious manufacturing systems design method, as an innovative way to achieve the triple bottom line objectives, 'doing good for people, planet and profit'.