Paper IJBS

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FACTORS AFFECTING PURCHASE INTENTION OF REMANUFACTURED SHORT LIFE-CYCLE PRODUCTS

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ABSTRACT

Environmental awareness drives remanufacturing practices. Remanufacturing is reported to be more environmental friendly because it consumes less energy and less virgin materials. In addition, it provides customers more affordable products at the same quality. Previous studies identifies focus on purchase intention of long life-cycle remanufactured products. Short life-cycle products present different challenges. These products have a life-cycle of one to two years. After one year they usually become functionally obsolete and undesirable. The aim of this study is to explore the influence of various factors on purchase intention of remanufactured short-life cycle products. A conceptual framework is developed by incorporating factors of product knowledge, perceived benefit, perceived risk, and purchase attitude. An empirical study was conducted on 310 mobile phone users in Surabaya, Indonesia by utilizing convenience sampling. The data was examined using structural equation modeling (SEM). The results indicate that product knowledge and purchase attitude have positive correlation with purchase intention. Perceived benefit and perceived risk do not directly correlate with purchase intention, but they correlate indirectly through purchase attitude. To the best of our knowledge, this article presents the first empirical study that explore factors influencing purchase intention of remanufactured short life-cycle products.

Keywords: Purchase intention; Remanufacturing; Short life-cycle product; Mobile phone; Empirical study; Indonesia.

1. INTRODUCTION

Mobile phone is a short life-cycle product with a useful lifespan of 18 months or less (Franke, Basdere, Ciupek, and Seliger, 2006). The rapid speed of mobile phone technology development reinforced with the fast change of customer needs cause the ever increasing waste electrical and

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electronic equipment (WEEE). Remanufacturing as one important element of closed-loop supply chains offers an attractive solution to this environmental problem. Remanufacturing not only needs less energy but also requires less virgin materials (Ijomah, 2009). However, even though remanufacturing offers a good solution for the increasing landfill of WEEE, the feasibility of remanufacturing practice depends on the customer acceptance of the remanufactured products (Wang and Hazen, 2016).

Many studies have been conducted on the supply aspects of remanufacturing practices, but little attention is given on the demand issues (Jimenez-Parra, Rubio, and Vicente-Molina, 2014). Among studies that try to investigate factors affecting consumer behavior, only van Weelden, Mugge, and Bakker (2016) studies customer acceptance of remanufactured mobile phones. Through their in-depth interview in Netherlands, van Weelden et al. (2016) identify that lack of awareness and a misunderstanding of remanufacturing concept prohibit it from reaching the full potential. Besides their study, there is no other study conducted on the acceptance of remanufactured mobile phones especially in the developing countries. On the other hand, Wang, Wiegerinck, Krikke, and Zhang (2013) develops an empirical framework measuring the influence of subjective norm, perceived behavioral control, purchase attitude, perceived risk, perceived benefit, and product knowledge on purchase intention of automobile spare parts. This study aims to investigate factors affecting purchase intention of remanufactured mobile phones in Indonesia using the empirical model proposed by Wang et al. (2013). However, not all factors from Wang et al. (2013) can be investigated. Subjective norm and perceived behavioral control are not feasible to be investigated because remanufactured mobile phone is not available yet in Indonesia. The rest of the paper is structured as follows. Literature review on remanufacturing, closed-loop supply chain, short life-cycle products and the development of research framework is provided in Section 2. Section 3 discusses the sample, sampling procedures, and the measures used in this study. In Section 4, data analysis of results and discussion of findings are presented. Finally, conclusions, limitations, and recommendations for future research are given in Section 5.

2. LITERATURE REVIEW

2.1. Closed-Loop Supply Chain

Closed-loop supply chain (CLSC) has been recognized as a solution to environmental concerns. CLSC has two parts, the forward supply chain and the reverse supply chain. While the forward supply chain is concerned with moving products from suppliers to customers, the reverse supply chain is related to the movement of used/unsold products from customers to suppliers (Kannan, Sasikumar, and Devika, 2010). The returned products will then go through a recovery process before being sold to the market. Lund (1984) classifies the recovery process of products into three categories, i.e. reconditioning, remanufacturing, and recycling. Here are the definitions of them.

- Reconditioning is a process to return a product to a satisfactory state that is not necessarily the same with of the new product (Ijomah, 2009).
- Remanufacturing is a process to return a product to its original specification or better and furnished with a warranty that is the same with of the new product or better (Ijomah, 2009).
- Recycling is a process to recover material value by converting the component material into the same or lower quality material (Ijomah, Bennett, and Pearce, 1999; Lund, 1984) .

Figure 1 illustrates the difference among these three CLSC methods.

Figure 1: The Difference between Reconditioning, Remanufacturing, and Recycling (adapted from Lund (1984))
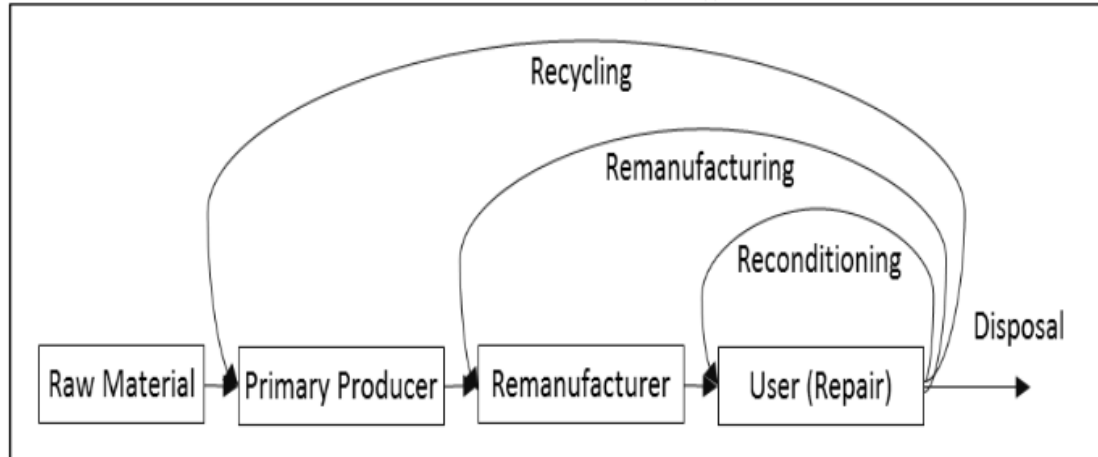
Remanufacturing practice is identified to be driven by environmental, legislative, and economic factors Amezquita, Hammond, Salazar, and Bras (1995). Remanufacturing provides attractive solution environmentally because it uses less virgin material, consumes less energy, and reduces landfill (Amezquita et al., 1995; Ijomah, 2009). Growing concern over environmental issues such as diminishing landfill space prompts governments to enforce take-back regulation, which requires manufacturers to retract their products at the end of their life cycle. In this case, remanufacturing offers desirable solution to convert waste into resalable product (Amezquita et al., 1995). In terms of economics, remanufacturing provides profitable options to remanufacturers and consumers. Remanufacturers benefit from much less capital investment to do remanufacturing, while consumers take advantage of cheaper products that have same value compared to the new ones (Amezquita et al., 1995).

2.2. Short Life-Cycle Product

Remanufacturing has been practiced more than three decades (Lund, 1984). It is known to provide good solution that supports take-back requirements compared to recycling (Amezquita et al., 1995). Lund (1984) describes remanufacturing is very suitable for long life-cycle and technologically stable products. Short life-cycle products such as mobile phone present a challenge for remanufacturing practices. Mobile phones have a use span of 18 months or less (Franke et al., 2006). In addition, mobile phones' feasibility to be remanufactured is worsened by the facts that they have rapidly declining and comparatively low value (Franke et al., 2006). However, the exponentially growing waste of unutilized mobile phones needs to be solved, either by remanufacturing or by recycling.

2.3.   *Consumer Behavior on Remanufactured Products*

The feasibility of remanufacturing depends critically on customer acceptance of the remanufactured products (Guide and van Wassenhove, 2009; van Weelden et al., 2016). However, most publications have been dedicated to the supply side and operations management of remanufacturing (Govindan, Soleimani, and Kannan, 2015; Jimenez-Parra et al., 2014; Wang et al., 2013). Very few papers are found on the area of consumer behavior on remanufactured products (Jimenez-Parra et al., 2014). In most studies the existence of market for remanufactured products is assumed (Wang et al., 2013). Efforts to investigate customer acceptance of remanufactured products are presented, among others, by Hazen, Overstreet, Jones-Farmer, and Field (2012), Wang et al. (2013), Jimenez-Parra et al. (2014), Gaur, Amini, Banerjee, and Gupta (2015), and van Weelden et al. (2016).

Consumer behavior studies on remanufactured products are mainly conducted through interviews and surveys. Gaur et al. (2015) identify environmental consciousness level, individual values, post-use perceptions, nature of purchase, and socio-cultural norms as main drivers for purchase intentions through grounded theory-based interview. In addition, they indicate that price, brand, product quality, and service quality are the underlying factors behind customers' decision to purchase remanufactured products over new ones. van Weelden et al. (2016), conducting in-depth interviews with consumers of remanufactured and new mobile phones, identify that misconception of remanufactured products, lack of awareness, lack of availability, and lack of the thrill of newness as the barriers for remanufactured mobile phones to be considered in the consideration phase. In addition, they find that personal, contextual, and product-related factors play important role during the evaluation phase.

Survey to identify factors affecting purchase intention of remanufactured products are conducted by Jimenez-Parra et al. (2014), Hazen et al. (2012), and Wang et al. (2013). Jimenez-Parra et al. (2014) identify subjective norm, motivations, and marketing mix variables as factors that affect purchase intention of remanufactured laptops. Hazen et al. (2012) report the link among ambiguity tolerance, perceived quality, and willingness to pay for remanufactured products. They describe a person with high ambiguity tolerance as a person that is willing to try new things and experience uncertain situation. Ambiguity tolerance is identified to be positively related with perceived quality and willingness to pay. The relationship between ambiguity tolerance and willingness to pay is partially mediated by perceived quality (Hazen et al., 2012).

Wang et al. (2013) develop a more comprehensive framework that links theory of planned behavior, theory of perceived risk, product knowledge and perceived benefit. Conducting the survey on 288 respondents, they identify that purchase intention of remanufactured automobile products is directly correlated with purchase attitude and perceived behavioral control, while perceived risk, perceived benefit, and product knowledge are indirectly correlated with purchase intention through purchase attitude. Among the six types of risks they take into account, i.e. financial, physical, performance, time, social and resource risks, the most dominant predictors of perceived risk are financial and performance risks (Wang et al., 2013).

2.4. Conceptual Framework

This study adopted the conceptual framework proposed by Wang et al. (2013) because their framework fits our research objective. They study the impact of product knowledge, perceived benefit, perceived risk, purchase attitude, subjective norm, and perceived behavioral control on purchase intention. However, only five out of those seven variables were included in this study. Proposed indicators for subjective norm and perceived behavioral control were not relevant in our study because remanufactured mobile phone is still not available in Indonesia. The following describes five variables that were examined in our study.

2.4.1. Product Knowledge

Product knowledge refers to consumers' familiarity and expertise about a product (Rao and Monroe, 1988; Wang et al., 2013). Familiarity is defined as the amount of experiences a consumer has with the product, while expertise is the capacity to conduct product-related assignments effectively (Rao and Monroe, 1988). Product knowledge is identified to improve purchasing decision by reducing uncertainty and providing better understanding about the product concept (Wang et al., 2013). van Weelden et al. (2016) report that customers that lack of knowledge of remanufactured products may assume that they are of low quality, which in turn will reduce their willingness to pay (WTP). On the other hand, it is argued that consumers that have more knowledge about remanufactured product are more likely to purchase it (Gaur et al., 2015; van Weelden et al., 2016). Wang et al. (2013) utilize quality, performance, price, type, and eco label as indicators of product knowledge.

2.4.2. Perceived Benefit

Perceived benefit is identified to influence purchase attitude and purchase intention (Wang et al., 2013). Literature reports that users of remanufactured products are driven primarily by environmental and economic concerns. Environmental awareness is indicated as the motive behind the use and purchase of remanufactured products (Gaur et al., 2015). Michaud and Llerena (2011) claim that environmental awareness increases consumers' perception on value of remanufactured products over the conventional ones. A construct proposed by Wang et al. (2013) that measures the benefits remanufactured products in terms of reduced purchase price, conservation of natural resources, and reduced environmental hazards are utilized in this study.

2.4.3. Perceived Risk

Perceived risk is defined as uncertainty about some negative consequences resulted from a purchase decision (McCorkle, 1990). It is identified as a crucial factor that influences purchase intention (Grewal, Gotlieb, and Marmorstein, 1994). Wang et al. (2013) propose the utilization six indicators, i.e. performance, time, physical, financial, social and resource risk, to measure perceived risk. Several studies identify that perception of low quality on remanufactured products discourages consumers' purchase intention (Gaur et al., 2015; van Weelden et al., 2016; Wang et al., 2013). van Weelden et al. (2016) suggest that the negative impact of perceived risk on purchase intention can be alleviated by using positive brand image, while Gaur et al. (2015) recommend the implementation of improved after-sales service to reduce this bad effect.

2.4.4.   Purchase Attitude

Purchase attitude is defined as individual's overall positive or negative assessment of performing a purchase (Wang et al., 2013). Moreover, Wang et al. (2013) identify that purchase attitude is the most dominant predictor of purchase intention followed by perceived behavioral control. The more positive the attitude towards the remanufactured product is the stronger the intention to purchase that product will be (Jimenez-Parra et al., 2014). Wang et al. (2013) propose four questions about consumers' opinion, idea, and feeling about buying remanufactured products to measure purchase attitude.

2.4.5.   Purchase Intention

Earlier studies on market acceptance of remanufactured products utilized willingness to pay (WTP) (Guide and Li, 2010; Hazen et al., 2012; Michaud and Llerena, 2011; van Weelden et al., 2016). More recent studies propose the use of purchase intention to measure consumer behavior (Gaur et al., 2015; Jimenez-Parra et al., 2014; Wang and Hazen, 2016; Wang et al., 2013). Wang et al. (2013) argue that purchase intention is the closest predictor of consumers' purchase behavior. Jimenez-Parra et al. (2014) identify that purchase intention of remanufactured laptop is influenced by purchase attitude, subjective norm, motivations, and marketing mix variables. Wang et al. (2013) indicate that purchase intention of remanufactured automobile parts is influenced by purchase attitude, perceived behavioral control, perceived risk, perceived benefit and product knowledge.

Based on the above discussion, the following hypotheses are developed:

H_1: Product knowledge is positively correlated with customers' purchase attitude towards remanufactured mobile phones.

H_2: Product knowledge is positively correlated with purchase intention of remanufactured mobile phones.

H_3: Perceived benefit is positively correlated with customers' purchase attitude towards remanufactured mobile phones.

H_4: Perceived benefit is positively correlated with purchase intention of remanufactured mobile phones.

H_5: Perceived risk is negatively correlated with customers' purchase attitude towards remanufactured mobile phones.

H_6: Perceived risk is negatively correlated with purchase intention of remanufactured mobile phones.

H_7: Purchase attitude is positively correlated with purchase intention of remanufactured mobile phones.

The conceptual framework of this study is given in the following Figure 2.

Figure 2: The Conceptual Framework
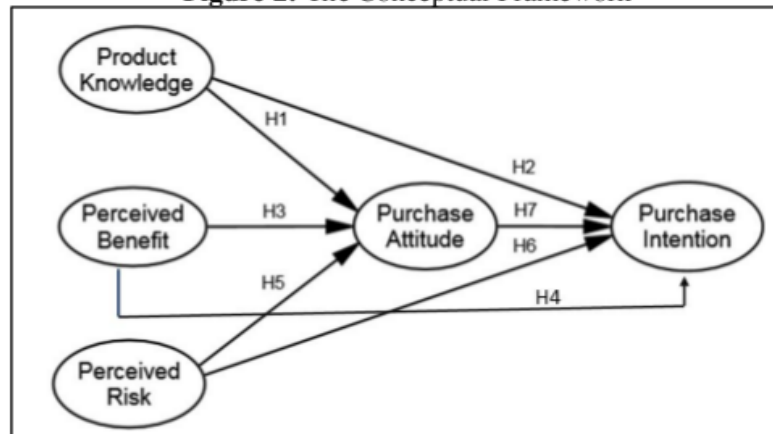
3.   METHODOLOGY

3.1.   *Sample and Procedures*

Target population of this study consisted of mobile phone users who had the capacity to make a purchase decision. The survey was conducted on mobile phone users in shopping malls and campuses in Surabaya, Indonesia. Prospective respondents were asked whether they were familiar with the concept of remanufacturing. Those who knew the concept of remanufacturing may continue filling the questionnaire, while those who did not know remanufacturing would be given a description of what remanufacturing is.

300 completed questionnaires were collected. Some demographic variables were identified during the survey. Most respondents (86%) had low and middle low income. 77% of respondents were between 18 and 30 years of age. The fact that majority of our respondents came from these age groups because we distributed our questionnaires in campuses and shopping malls. Complete demographic profile of respondents is provided in Table 1.

Table 1: Demography of Respondents

	Frequency	Percentage		Frequency	Percentage
Gender			*Age*		
Male	131	43.7%	Under 18 years	5	1.7%
Female	169	56.3%	18-23 years	106	35.3%
			24-30 years	125	41.7%
Monthly income			31-40 years	40	13.3%
Less than 3 mio rupiahs	131	43.7%	41-50 years	21	7.0%
3-7.5 mio rupiahs	127	42.3%	Above 50 years	3	1.0%
7.5-15 mio rupiahs	28	9.3%			
15-25 mio rupiahs	8	2.7%			
More than 25 mio rupiahs	6	2.0%	*Education*		
			Elementary	3	1.0%
Occupation			Junior high	5	1.7%
Entrepreneurs	51	17.0%	Senior high	72	24.0%
Employees	138	46.0%	Diploma	26	8.7%
Military personnels	10	3.3%	Bachelors	172	57.3%
Professionals	17	5.7%	Masters	17	5.7%
University students	84	28.0%	Doctorates	5	1.7%

3.2.   The Measures

This study utilized constructs proposed by Wang et al. (2013). However, two constructs were not included because they were not relevant in the context of our study, i.e. subjective norm and perceived behavioral control. The questions were translated into Indonesian and pre-tested by selected respondents to get feedback about clarity of guideline and questions. Survey instrument of this study comprised of two parts. The first part were questions about respondents' profile, while the second part consisted of indicators of the five constructs, i.e. product knowledge, perceived benefit, perceived risk, purchase attitude, and purchase intention. Five-point Likert scale was used for all 23 indicators in the second part, where 1 = strongly disagree and 5 = strongly agree.

4.   FINDINGS

Data analysis began with conducting screening for missing data. There was no missing data found in the raw data. However, 19 respondents were found to respond indifferently. These 19 responses were removed from further analysis. In the next step, we performed univariate outlier screening and found two cases to be univariate outliers, i.e. cases with z value of more than 4.0 (Hair, Black, Babin, and Anderson, 2010). Mahalanobis distance (D^2) divided by the number of variables was used to identify multivariate outliers. We adopted a conservative p-value of 0.001 as recommended by Hair et al. (2010) to determine multivariate outlier cases. This assessment detected 23 cases to be multivariate outliers and deleted from the data.

Two-step approach proposed by Anderson and Gerbing (1988) were used to analysis data in this study. First, we developed measurement models for all variables, i.e. product knowledge, perceived

benefit, perceived risk, purchase attitude, and purchase intention. Next, we developed structural models to examine the relationship among the five variables.

4.1. Measurement Model

Measurement models of all variables indicated satisfactory results. Scale validity and reliability for product knowledge, perceived benefit, perceived risk, purchase attitude, and purchase intention are given in Table 2. We retained items with loading greater than 0.45 especially if the reliability measure drops significantly when those items are removed. From the initial model one item each was removed from perceived benefit and perceived risk. All constructs satisfied the requirement for good validity and reliability recommended by Hair et al. (2010), that is factor loadings greater than 0.45 and Cronbach's α values at least 0.7. Model fits also satisfied the requirement recommended by Hair et al. (2010), that is models with number of indicators between 12 and 30 and number of observations of more than 250 should have CMIN/DF ≤ 3, CFI ≥ 0.92, RMSEA ≤ 0.07, and SRMR ≤ 0.08.

Table 2: Scale Validity and Reliability for All Variables

Scales	Items	Loading	Cronbach's α	Scales	Items	Loading	Cronbach's α
Product Knowledge	pk_1	0.81	0.885	Perceived Risk	pr_1	0.88	0.851
	pk_2	0.88			pr_2	0.88	
	pk_3	0.75			pr_3	0.70	
	pk_4	0.75			pr_4	0.68	
Perceived Benefit	ben2	0.80	0.878		pr_6	0.49	
	ben3	0.86		Purchase Intention	pi1	0.84	0.927
	ben4	0.87			pi2	0.86	
Perceived Attitude	att1	0.91	0.929		pi3	0.83	
	att2	0.91			pi4	0.91	
	att3	0.83			pi5	0.80	
	att4	0.86					

Notes: CMIN/DF = 1.429, CFI = 0.980, RMSEA = 0.041, and SRMR = 0.0589

4.2. Structural Model

A structural model was developed using all variables obtained from the first step to test relationship among them. The structural model fit indicated satisfactory results with CMIN/DF = 1.426, CFI = 0.976, RMSEA = 0.041, and SRMR = 0.0589. Table 3 provides the standardized effect estimates of all correlations. Product knowledge was positively correlated with purchase attitude with standardized regression weight (β) = 0.191 and $p < 0.001$. Perceived benefit was also positively correlated with purchase attitude ($\beta = 0.581$ and $p < 0.001$), while perceived risk was negatively correlated with purchase attitude ($\beta = -0.402$ and $p < 0.001$). The Thus, H_1, H_3, and H_5 were all supported. Product knowledge, perceived benefit, and perceived risk explained 62.7% of the variance of purchase attitude towards remanufactured mobile phones ($R^2 = 0.627$).

A path diagram was developed to examine the mediating effect of purchase attitude on the relationship between product knowledge, perceived benefit, perceived risk, and purchase intention. The path diagram is shown in Figure 3. Perceived attitude was identified to be correlated with purchase intention ($\beta = 0.753$ and $p < 0.001$). Therefore, H_7 was also supported. In the presence of purchase attitude, only direct effect of product knowledge on purchase intention was significant ($\beta = 0.156$ and $p = 0.001$), while direct effects of perceived benefit and perceived risk on purchase intention were no longer significant. Therefore, hypothesis H_2 was supported, while hypotheses H_4 and H_6 were not supported. The indirect effects of product knowledge, perceived benefit, and perceived risk on purchase intention through purchase attitude were all significant with standardized regression weight of 0.144, 0.438, and -0.301, respectively. It can be inferred that the effects of product knowledge on purchase intention was partially mediated by purchase attitude, while the effects of perceived benefit and perceived risk on purchase intention were fully mediated by purchase attitude.

There were five control variables that we tested in our structural model, i.e. gender, age, education, monthly income, and occupation. However, only gender and income exhibits significant effects on purchase intention. Gender and income were negatively correlated with purchase intention with $\beta = -0.203$ and -0.137, respectively. It implied that male phone users and lower income users were more likely to purchase remanufactured mobile phone. A further analysis on the source of difference between male and female responses showed that male respondents had significantly better product knowledge ($p = 0.015$). Including all predictors and control variables, the model explained 73.3% of variance of purchase intention of remanufactured mobile phones ($R^2 = 0.733$).

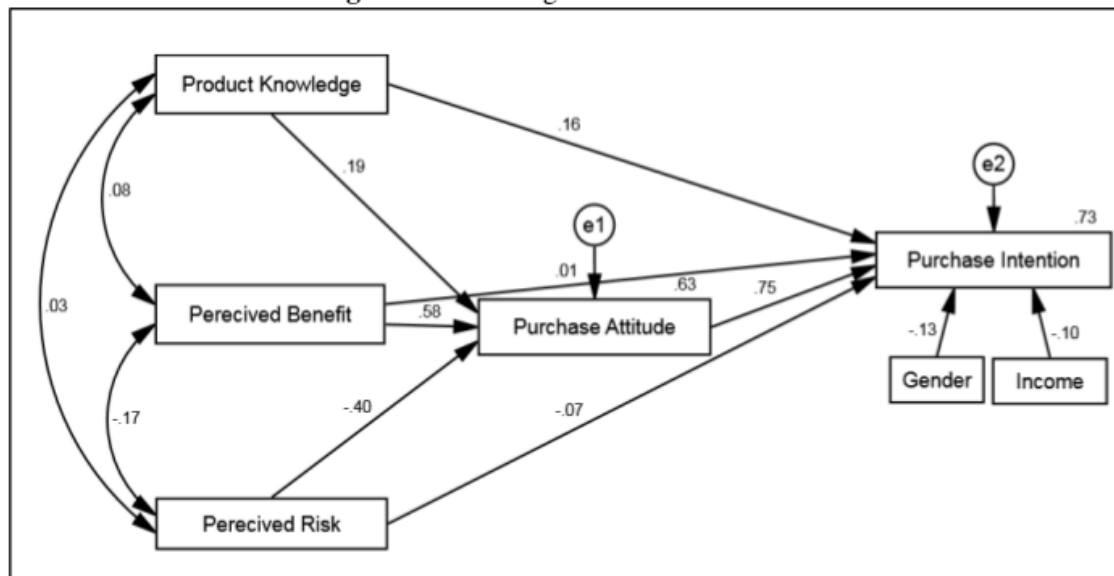**Figure 3:** Path Diagram of All Variables

Table 3: Table of Effect Estimates and their *p*-values

Relationship	Direct Effect	p	Indirect Effect	p	Comment
Gender – Purchase Intention	-0.203	< 0.001	-	-	
Income – Purchase Intention	-0.137	0.002	-	-	
Product Knowledge – Purchase Attitude	0.191	< 0.001	-	-	
Perceived Benefit – Purchase Attitude	0.581	< 0.001	-	-	
Perceived Risk – Purchase Attitude	-0.402	< 0.001	-	-	
Purchase Attitude – Purchase Intention	0.753	< 0.001	-	-	
Product Knowledge – Purchase Intention	0.156	0.001	0.144	0.001	Partial mediation
Perceived Benefit – Purchase Intention	0.081	0.866	0.438	0.001	Full mediation
Perceived Risk – Purchase Intention	-0.066	0.112	-0.301	0.001	Full mediation

5. DISCUSSION

There are three findings from this study. First, it confirms the finding of Wang et al. (2013) that product knowledge and perceived benefit have positive effects on purchase attitude, while perceived risk produces negative impact on purchase attitude. Second, both purchase attitude and product knowledge have positive impact on purchase intention of remanufactured mobile phones. This finding is contrary to their report that product knowledge has negative effect on purchase intention (Wang et al., 2013). Third, we identify the impact of gender and income on purchase intention. The following paragraphs explain these findings.

Product knowledge is identified to have direct and indirect positive impact on purchase intention. The more knowledge the prospective customers have about remanufactured mobile phone the stronger their purchase intention is. Wang et al. (2013) do not find the direct impact of product knowledge on purchase intention. They conducted their survey on automobile part users, while our study surveyed users of mobile phones that represented short life-cycle products. Product knowledge seems to have more crucial impact in short life-cycle products such as mobile phone because it assures customers that even though there is rapid advancement in mobile phone technology, the remanufactured product has been equipped with the necessary upgrades to function properly. Our finding is also in line with the findings of Gaur et al. (2015) and van Weelden et al. (2016). An individual that has the knowledge about a remanufactured product is more likely to purchase that product because they can identify the performance level, features, price range, and warranty of a remanufactured product.

Perceived benefit is identified only has indirect impact on purchase intention through purchase attitude. Wang et al. (2013) propose a construct that measures economic and environmental benefit of purchasing remanufactured products. However, our respondents only agreed on the environmental benefit. That is why indicator *ben1* that measures economic benefit was dropped because of insufficient factor loading. It can be inferred that most prospective users of remanufactured mobile phones are primarily driven by environmental concern. The fact that most of our respondents were surveyed in middle class and upper middle class environment may present a bias. It is probably the cause that economic benefit does not produce satisfactory factor loading.

Perceived risk is indicated to have negative impact on purchase attitude. Our finding confirms the finding of Wang et al. (2013) that perceived risk has negative impact on purchase intention and indirect negative impact on purchase intention. In addition, we also observed social risk (*ben5*) did not produce satisfactory factor loading as reported by Wang et al. (2013).

Our study also indicates that purchase attitude is a dominant predictor of purchase intention ($\beta = 0.753$ and $p < 0.001$). Yadav and Pathak (2016) that studies the purchase intention of organic food among young consumers also identifies the link between attitude and purchase intention. Although perceived benefit and perceived risk had high standardized regression weights on purchase attitude, they did not have direct impact on purchase intention. In other words, perceived benefit and perceived risk can only affect an individual's attitude towards purchasing a remanufactured mobile phone. This finding is in line with the report of Wang et al. (2013).

In addition to the findings of Wang et al. (2013), we observe that gender has significant impact on purchase intention. Previous study conducted by Wang and Hazen (2016) also identify that males have higher purchase intention of remanufactured products compared to females. The finding that male respondents have better product knowledge explains this result. It is easier for them to make decision because they know what a remanufactured mobile phone is. We also notice that income level has a significant impact on purchase intention of remanufactured mobile phones. Remanufactured mobile phones are more attractive to people from lower income level. This finding is also reported by Ijomah (2009). This situation is very reasonable because higher income individuals have more options on mobile phone purchase. van Weelden et al. (2016) describe two classes of mobile phone users, utilitarian users and hedonistic users. Utilitarian users focus on the quality and function of the products, while hedonistic ones emphasize on receiving pleasure and excitement in buying the new product (Gaur et al., 2015). Therefore, it is quite plausible that higher income people tend to exhibit stronger hedonistic behavior compared to the lower income people.

6.   CONCLUSION

Study on consumer behavior of remanufactured products are very limited. This study aims to explore the influence of product knowledge, perceived benefit, perceived risk, and purchase attitude on purchase intention of remanufactured mobile phone. Purchase attitude and product knowledge are identified to have positive impact on purchase intention of remanufactured mobile phone, while perceived benefit and perceived risk influence purchase intention through purchase attitude. It appears that product knowledge is important in affecting purchase intention of remanufactured short life cycle products, and this is not necessarily true for products with longer life-cycle. The practical implication of this research is that government agencies and companies need to educate the society so that the intention to purchase remanufactured products can be improved.

This study has some identified limitations. First, this study utilized convenience sampling. The fact that the survey was conducted in shopping malls and campuses in Surabaya, Indonesia induces limitation the generalization of the findings. The second limitation comes from the availability of remanufactured mobile phone in Indonesia. There is no real remanufactured mobile phone available in Indonesia. Respondents were asked to provide feedback based on imaginary remanufactured mobile phones. This situation might introduce bias on their responses. However,

this study is necessary to examine factors that will influence their purchase intention on the real products later on. The third limitation is that we do not address brand difference in this study that has been identified as an important factor in some studies. Incorporating brand difference in factors affecting purchase intention could be an interesting and important future research. Recommendation for future research will be conducting similar study on different short life-cycle products with a more random sampling method.

REFERENCES

Amezquita, T., Hammond, R., Salazar, M., & Bras, B. (1995). *Characterizing The Remanufacturability of Engineering Systems*. Paper presented at the 1995 ASME Advances in Design Automation Conference, Bostin, MA.

Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin, 103*(3), 411-423.

Franke, C., Basdere, B., Ciupek, M., & Seliger, S. (2006). Remanufacturing of mobile phones—capacity, program and facility adaptation planning. *Omega, 34*(6), 562-570.

Gaur, J., Amini, M., Banerjee, P., & Gupta, R. (2015). Drivers of consumer purchase intentions for remanufactured products: A study of Indian consumers relocated to the USA. *Qualitative Market Research: An International Journal, 18*(1), 30-47.

Govindan, K., Soleimani, H., & Kannan, D. (2015). Reverse logistics and closed-loop supply chain: A comprehensive review to explore the future. *European Journal of Operational Research, 240*(3), 603-626.

Grewal, D., Gotlieb, J., & Marmorstein, H. (1994). The Moderating Effects of Message Framing and Source Credibility on the Price-Perceived Risk Relationship. *Journal of Consumer Research, 21*(1), 145-153.

Guide, V. D. R., Jr., & Li, J. (2010). The Potential for Cannibalization of New Products Sales by Remanufactured Products. *Decision Sciences Journal, 41*(3), 547-572.

Guide, V. D. R., Jr., & van Wassenhove, L. N. (2009). The Evolution of Closed-Loop Supply Chain Research. *Operations Research, 57*(1), 10-18.

Hair, J. F., Jr., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hazen, B. T., Overstreet, R. E., Jones-Farmer, L. A., & Field, H. S. (2012). The role of ambiguity tolerance in consumer perception of remanufactured products. *International Journal of Production Economics, 135*(2), 781-790.

Ijomah, W. L. (2009). Addressing decision making for remanufacturing operations and design-for-remanufacture. *International Journal of Sustainable Engineering, 2*(2), 91–102.

Ijomah, W. L., Bennett, J. P., & Pearce, J. (1999). *Remanufacturing: Evidence of Environmentally Conscious Business Practice in the UK*. Paper presented at the First International Symposium on Environmentally Conscious Design and Inverse Manufacturing, Tokyo.

Jimenez-Parra, B., Rubio, S., & Vicente-Molina, M.-A. (2014). Key drivers in the behavior of potential consumers of remanufactured products: a study on laptops in Spain. *Journal of Cleaner Production, 85*, 488-496.

Kannan, G., Sasikumar, P., & Devika, K. (2010). A genetic algorithm approach for solving a closed loop supply chain model: A case of battery recycling. *Applied Mathematical Modelling, 34*(3), 655-670.

Lund, R. T. (1984). Remanufacturing: The Experience of the United States and Implications for Developing Countries. *World Bank Technical Paper*.

McCorkle, D. E. (1990). The Role of Perceived Risk in Mail Order Catalog Shopping. *Journal of Direct Marketing, 4*(4), 26-35.

Michaud, C., & Llerena, D. (2011). Green Consumer Behaviour: an Experimental Analysis of Willingness to Pay for Remanufactured Products. *Business Strategy and the Environment, 20*(6), 408–420.

Rao, A. R., & Monroe, K. B. (1988). The Moderating Effect of Prior Knowledge on Cue Utilization in Product Evaluations. *Journal of Consumer Research, 15*(2), 253-264.

van Weelden, E., Mugge, R., & Bakker, C. (2016). Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. *Journal of Cleaner Production, 113*, 743-754.

Wang, Y., & Hazen, B. T. (2016). Consumer product knowledge and intention to purchase remanufactured products. *International Journal of Production Economics, 181*(Part B), 460-469.

Wang, Y., Wiegerinck, V., Krikke, H., & Zhang, H. (2013). Understanding the purchase intention towards remanufactured product in closed-loop supply chains-An empirical study in China. *International Journal of Physical Distribution & Logistics Management, 43*(10), 866-888.

Yadav, R., & Pathak, G. S. (2016). Intention to purchase organic food among young consumers: Evidences from a developing nation. *Appetite, 96*, 122-128.

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