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DRIVERS AND BARRIERS OF CONSUMER PURCHASE INTENTION OF REMANUFACTURED MOBILE PHONES: A STUDY ON INDONESIAN CONSUMERS Didik Wahjudi Department of Mechanical Engineering, Petra Christian University, Surabaya 60236 Indonesia, E-mail: dwahjudi@petra.ac.id Shu-san Gan Department of Mechanical Engineering, Petra Christian University, Surabaya 60236 Indonesia, E-mail: gshusan@petra.ac.id Yopi Yusuf Tanoto Department of Mechanical Engineering, Petra Christian University, Surabaya 60236 Indonesia, E-mail: yopi.tanoto@petra.ac.id Jerry Winata Department of Mechanical Engineering, Petra Christian University, Surabaya 60236 Indonesia, E-mail: m24414051@petra.ac.id

ABSTRACT The ever-increasing waste electrical and electronic equipment (WEEE) motivates industries to perform closed-loop supply chain (CLSC). Remanufacturing, one form of CLSC, has been widely practiced especially in developed countries. In addition to landfill reduction, remanufacturing also saves energy and conserves natural resources. While several studies have been devoted to evaluate its business and technical aspects, little effort is given to explore the acceptance of remanufactured short life-cycle products such as mobile phone. Mobile phone encounters functional and psychological obsolescence. As a country with the fourth largest mobile phone users in the world, Indonesia needs to tackle the vast waste electrical and electronic equipment (WEEE) that comes from obsolete mobile phones. This study investigates the drivers and barriers of consumer purchase intention of remanufactured mobile phones. A case study was conducted through in-depth interviews with thirteen respondents. These respondents represented different age groups, gender, and social classes. Two key drivers of consumer purchase intention are affordable price and upgraded specification. Among the main barriers are the regulatory concern, trend concern, and obsolescence concern. Depending on the level, perceived quality and quality assurance can be either drivers or barriers. The implication of this study is that mobile phone remanufacturers should focus on providing phones with upgraded specification at an affordable price and to provide consumer information about the remanufacturing process. This study also emphasizes the urgency for the government to impose strict regulation that protects consumers from counterfeit products. Keywords: remanufacturing, mobile phone, short life-cycle product, case study, Indonesia

1. INTRODUCTION Remanufacturing has been identified as a good solution to the depletion of energy reserves and natural resources. In addition to the reduction of energy and virgin material consumption, remanufacturing also reduces landfill and increases profitability (Ijomah et al., 2007). The literature suggests remanufacturing practices are suitable for high value, durable, and technologically stable products (Lund, 1984). A mobile phone is a short life-cycle and relatively low-value product (Franke et al., 2006). However, the rapid generation of WEEE caused by the use of mobile phone presents a challenging problem. Geyer and Blass (2010) identify that mobile phone users are more likely to reuse the handsets than to recycle them. Given the option to remanufacture them, it is interesting to examine whether users will be more interested to remanufacture their end-of-life mobile phones or to reuse them. Remanufacturing develops into a very big business in the USA and some

European countries (Gaur et al., 2015, Parker et al., 2015). However, it is still in its embryonic stages in many emerging and developing countries. Several studies are conducted to identify driving factors and barriers of remanufacturing business. Gaur et al. (2015) argue that environmental consciousness level, individual values, and socio-cultural norms are among the major drivers of consumer purchase intentions for remanufactured products. Furthermore, Chapman et al. (2010) identify the biggest opportunity for remanufacturing is for high added-value products, where the price of the remanufactured item is very competitive compared to the new products. Indonesia has the fourth-largest mobile phone users in the world (Central Intelligence Agency, 2016). Guide and van Wassenhove (2009) identify that most mobile phone users change their phones every year. While Indonesia is not known as an environmentally-conscious society, it is crucial to probe the prospect of mobile phone remanufacturing business in Indonesia. This study aims to investigate the drivers and barriers of consumer purchase intention of remanufactured mobile phones in Indonesia.

2. LITERATURE REVIEW

2.1. Closed-Loop Supply Chain

The increase of mobile phone use creates the fast production of WEEE. At the end of life, a time at which it cannot satisfy the first user (Rathore et al., 2011), a mobile phone can go through an open-loop supply chain or closed-loop supply chain (CLSC). In an open-loop supply chain, mobile phones are landfilled or incinerated. In a closed-loop supply chain, mobile phones are taken back and reused as products, components, parts, and materials. Lund (1984) indicates the attempts to retain the value of products can be classified into five categories. The five categories are illustrated in Figure 1. We use the following definitions provided by Ijomah et al. (1999) and Lund (1984) throughout this paper.

- ? Repair: a process of bringing a damaged product back to a functional condition by the same user.
- ? Reuse: a process a using a functional product by another user after the product no longer satisfies the first user.
- ? Refurbishing/reconditioning: a process of restoring a product to a satisfactory state that is not necessarily the same with of the new product.
- ? Remanufacturing: a process of restoring a product to its original specification or better and provided with a warranty that is comparable with the warranty of the new product.
- ? Recycling: a process of recovering material value by transforming the product into a material with the same quality or lower.

Figure 1. The five categories of closed-loop supply chain

2.2. Remanufacturing of Mobile Phones

Remanufacturing gets a lot of attention from researchers and academia because of its unique characteristics. Reuse is limited to a functional phone, while refurbishing or reconditioning can only be done on handsets that need little processing such as replacement of worn or damaged parts, resurfacing and repainting (Rathore et al., 2011). However, mobile phone refurbishing is only done by resellers, not OEMs (Geyer and Blass, 2010). Therefore, refurbished mobile phones do not come with a warranty. In addition, the refurbished mobile phones have diverse qualities because of the nature of the operations and the refurbishing operators. These conditions limit the distribution of refurbished mobile phones. On the other hand, remanufacturing is performed by OEMs and independent remanufacturers (Parker et al., 2015). The fact that remanufactured products come with a warranty and have gone through a stricter process causes remanufactured products can be distributed in a wider market, even in the overseas market (Chapman et al., 2010). In developing and emerging countries where remanufacturing is still in embryonic stage, confusion between remanufacturing and refurbishing often occurs. Gaur et al. (2015) identify two characteristics that distinguish remanufacturing from refurbishing. First, the level disassembly of remanufacturing is at the component level, while it is at the module level for refurbishing. Second, remanufactured mobile phones come with a warranty, which refurbished ones do not have.

2.3. Consumer Acceptance of Remanufactured Products

Several studies have explored the consumer acceptance of remanufactured products. Two indicators that are often used to indicate consumer acceptance are willingness-to-pay and purchase intention. Some authors conduct studies on the willingness-to-pay for remanufactured products. Guide and Li (2010) identify that WTP for remanufactured products is less than that for the new products both for consumer and commercial products. Atasu et al. (2010) argue that WTP for remanufactured consumer products are 15 percent lower than that for the new products, while

the WTP for remanufactured commercial products is only 10 percent less than that for the new ones. However, Michaud and Llerena (2011) find that the lower WTP for remanufactured products only happens when the consumers are not informed about the environmental benefits of the remanufactured products. Once they are informed about they are informed about the environmental benefit, the consumers are willing to pay the same price as that for the new products. Atasu et al. (2010) classify the market into three consumer groups, i.e. newness-conscious consumers, functionality-oriented consumers, and green consumers. Consumers that are newness-conscious will not consider remanufactured products unless they are offered at a very low price compared to the new ones. Functionality-oriented consumers will choose the remanufactured products if they are offered at a slightly lower price. This consumer group perceives the value of remanufactured products is very similar to that of the new ones. On the other hand, green consumers will prefer remanufactured products even though the price is more expensive because they are more environmentally-friendly (Atasu et al., 2010). Yet, the existence of this green segment is denied by Michaud and Llerena (2011). Purchase intention for remanufactured products has been studied by some researchers. Wang et al. (2013), conducting empirical studies on remanufactured automobile parts, identify that purchase intention is directly influenced by purchase attitude, perceived behavioral control, subjective norm, and product knowledge. They find an anomaly in the negative impact of product knowledge on purchase intention. In addition, they indicate that purchase intention for remanufactured automobile parts is also influenced indirectly by perceived benefit, perceived risk, and product knowledge. Jimenez-Parra et al. (2014) conduct a study to investigate factors that affect purchase intention for remanufactured laptops. They identify that purchase attitude, subjective norm, price, environmental factors, design, and brand reputation are positively influenced the purchase intention for remanufactured laptops. Gaur et al. (2015) identify six motives that influence the purchase intention for remanufactured products, i.e. environmental consciousness, individual values and attitudes, utilitarian buying behavior, hedonistic buying behavior, nature of the product, and socio-cultural norms. Wang and Hazen (2016) argue the importance of product knowledge that includes quality knowledge, cost knowledge, and green knowledge on the purchase intention for remanufactured products. They identify that both perceived value and perceived risk are predominantly influenced by quality knowledge, followed by cost knowledge, while green knowledge only contributes to improving the perceived value of the products. The trade-off between perceived value and perceived risk decides how much intention the consumer have to purchase the remanufactured product. A recent survey conducted by these authors on mobile phone consumers indicates that purchase intention is directly influenced by product knowledge and purchase attitude (Wahjudi et al., 2018). However, purchase intention is not directly influenced by perceived benefit and perceived risk, but perceived benefit and perceived risk influence purchase attitude, which in turn improves the purchase intention.

3. Research methodology

This study used a case study method to explore the drivers and barriers of consumer purchase intention for remanufactured mobile phones. A case study protocol was developed to guide the interview. The protocol consisted of questions about demographic information of respondents, the familiarity with remanufactured products, personal preference on mobile phones, perceived benefits, perceived risks, and their purchase intention for remanufactured mobile phones. Thirteen respondents interviewed in this study were to represent different genders, age groups, and social classes. The diversity of background was designed to provide a more diverse perspective in this case study. Each interview took about 30 to 40 minutes. The resulted audio record was transcribed and coded. In this study, we cannot interview actual remanufactured mobile phone buyers because there are no remanufactured mobile phones available in Indonesia. To resolve this problem, the respondents were given a short description of what remanufactured mobile phone is, especially to those who never hear about remanufactured products. Table 1 provides the demographics of respondents.

Respondent	Age	Gender	Social Class
C1	≤ 22 years	Male	Middle
C2	≤ 22 years	Female	Middle
C3	≤ 22 years	Male	Upper Middle
C4	≤ 22 years	Female	Upper Middle

Upper Middle C5 > 22 years Female Middle C6 > 22 years Male Lower Middle C7 > 22 years Male Upper Middle C8 > 22 years Male Middle C9 > 22 years Male Middle C10 ≤ 22 years Male Lower Middle C11 ≤ 22 years Female Lower Middle C12 > 22 years Female Poor C13 > 22 years Female Upper Middle 4.

RESULTS AND DISCUSSIONS The transcribed record was coded to identify the recurring themes. NVivo software was used to analyze the patterns in the transcribed record. The resulted codes were discussed with other research team members to improve reliability. There were eighteen codes discovered in this study. These eighteen codes were classified into four driving factors and three inhibiting factors. The driving factors with their supporting codes and respective quotations are given in Table 2. Table 3 gives the list of inhibiting factors with their supporting codes and respective quotations. Table 2. List of codes with their respective quotation and resulted from driving factors No. Codes Quotation from interviews Factors 1 Eco-consciousness Remanufacturing reduces electronic waste; There are uniqueness and pride in using remanufactured products; Environmental Remanufacturing does not exploit the nature excessively; 2 Natural resources It conserves the environment sufficiently; Benefit concern It supports the promotion of green products; 3 Affordable price The price is more affordable; The price is very low; We can have it at a cheap price but it has the features of new phones; The price is affordable, but the performance is almost the same as the new ones; Economic Benefit 4 Market competition It's good for business competition because mobile phones' price is increasing; 5 Upgraded specification The specification can be upgraded; performance is better than the used ones; The specification is the most important; It has good features; It has features of new phones at a cheap price; 6 Perceived quality The quality is still good, not much different from the new one; The outside case is flawless; In terms of durability, it isn't much different from the new ones; Other people cannot distinguish remanufactured [mobile phones from the new ones]; Quality Benefit 7 Quality assurance The product is repaired by a professional, so it can be trusted; There is a quality inspection, so it is more trusted; The remanufacturing is done by the factory and it comes with a warranty, so it is trusted; It has been officially fixed so it's should be reliable; 8 Product warranty It is reliable because it comes with a warranty; 9 Social expectation Very accommodating and suitable for Indonesian people who are looking for cheap mobile phones that have good features and performance; In Indonesia people are prioritizing prices rather than trends; It is suitable for consumptive people who often change mobile phones; It creates a chance for the middle to lower middle classes to buy the top brand mobile phones; It is suitable for Indonesia because it has many middle to lower middle-class people; Social Benefit Table 3. List of codes with their respective quotation and resulted inhibiting factors No. Codes Quotation from interviews Factors 1 Obsolescence concern Replacement parts are unavailable because of obsolescence; 2 Regulatory concern Fear of buying used mobile phones, not the remanufactured ones; I do not know the components inside, good or not, original or counterfeit; Online stores may sell counterfeit products; I am afraid to buy it from an unauthorized retailer; Economic Risk 3 Quality assurance I am not convinced of the quality. Perhaps used mobile phone has better quality; There is no trust in remanufactured products; I am afraid there is a broken part that is not replaced by the new one, but it is repaired partially; I am afraid there is unrepaired damage; 4 Perceived quality I am afraid that the mobile phone fails and I need to go to the service center frequently; The product may fail again and unrepairable; Product quality is not as expected; Not every part can be upgraded; Electronic products have a limited lifespan; Quality Risk 5 Lack of OEM's support There is no statement from the manufacturer that they support remanufacturing; 6 Prestige concern There is a sense of shame to buy a remanufactured mobile phone; It is more prestigious to buy new mobile phone, even the cheap one; Indonesian people tend to buy new HP and pursue prestige; Indonesian people tend to be consumptive and brand-conscious; 7 Subjective norm There isn't any friend that recommends remanufactured mobile phone; Social Risk 8 Public opinion The society's viewpoint and public confidence in remanufactured mobile phones is still low; 9 Trend concern The model is outdated; Middle to upper-middle-class people tend to follow the new model in terms of phone weight, size, etc.; Later model is much slimmer,

the older model is bulkier; People tend to follow the trend, models of mobile phone change quickly; 4.1. Drivers of Purchase Intention of Remanufactured Mobile Phones There are four driving factors identified in this study, i.e. environmental benefit, economic benefit, quality, benefit, and social benefit. Almost every respondent mentions affordable price as the main driver for considering to purchase remanufactured mobile phones. In addition to driving the purchase intention of remanufactured mobile phones, the affordable price also provides stronger market competition to control the ever-increasing price of new mobile phones. Quality benefit has four coded themes, i.e. upgraded specification, perceived quality, quality assurance, and product warranty. Along with the affordable price, the upgradeable specification is the main attraction for purchasing remanufactured mobile phones. Positive perceived quality and quality assurance improve the purchase intention, while product warranty can be considered as a basic factor as in the Kano model (Kano et al., 1984). The existence of a product warranty is important to ensure service reliability amid lack of confidence in the product quality. Mobile phone remanufacturing provides a social benefit because it allows consumers from middle to lower middle classes to buy top brand mobile phones. "It creates a chance for the middle to lower middle classes to buy the top brand mobile phones" These consumer segment usually looks for cheap mobile phones that have good features and performance. In addition, most respondents indicate that remanufactured mobile phones are suitable for Indonesia that has a vast population and majority of its population is from the middle and lower middle classes. All respondents confirm the environmental benefit that comes from the reduction of e-waste and conserves natural resources provided by mobile phone remanufacturing. 4.2. Barriers of Purchase Intention of Remanufactured Mobile Phones Economic risk, quality risk, and social risk are the three risks identified through this study. Economic risk comes from obsolescence concern and regulatory concern. Some respondents argue that the remanufactured mobile phones may become obsolete quickly. This situation will cause scarcity of replacement parts when their remanufactured mobile phones need repair and replacement of parts. The other concern deals with regard to the loose legal protection of consumers. In the absence of adequate legal protection, consumers may receive used mobile phones instead of the remanufactured ones, especially when they purchase from online stores and unauthorized retailers. Quality risk consists of quality assurance, perceived quality, and lack of OEM's support. Several respondents express their doubts about the quality assurance of remanufactured mobile phones. This is reinforced by the lack of support from mobile phones' producers. Respondents are afraid that the remanufactured mobile phones do not have the promised quality, which is as good as new products. This situation may be caused by the fact that remanufacturing is still very unfamiliar to many Indonesians. The third kind of risk is the social risk. Several respondents indicated that remanufactured mobile phone is not a prestigious product. They argue that the middle and upper-middle-class consumers tend to be consumptive and very brand-conscious to show their prestige. Furthermore, lacks of recommendation from friends and other influential people around them will preclude them from purchasing remanufactured mobile phones. The fact that a mobile phone not only serves as a communication device but also serves as a fashion item, encourages mobile phone users to change their mobile phones in order to follow the trend. Guide and van Wassenhove (2009) claim that mobile phone users change their devices every year. Table 4 presents the mapping of each respondent with their purchase attitude, purchase intention, and the reasons. Out of thirteen respondents, only eleven of them have the interest to purchase remanufactured mobile phones. The reasons why they do not have the interest to purchase are low perceived quality, low trust on quality assurance, trend concern, and regulatory concern. Respondent C9 is still unsure of the quality of remanufactured products because he is not familiar with this product. He also thinks that remanufactured mobile phones are outdated because of the fast changing trend of mobile phone models. Respondent C13 is afraid to purchase a remanufactured mobile phone because: "Remanufactured mobile phones may fail again at any time and unrepairable" She also expresses concern about the process quality assurance, whether the defective parts will be replaced by new parts or partially repaired. The other

concern is with regard to the product regulation. She fears about buying used mobile phones, instead of the remanufactured ones. Among respondents that express positive purchase attitude towards remanufactured mobile phones, only five of them have the purchase intention when the remanufactured mobile phones become available. Upgraded specification, affordable price, and product warranty improve the consumer purchase intention, while the regulatory concern, trend concern, and obsolescence concern diminish the purchase intention. Perceived quality and process quality assurance can improve or reduce the consumer purchase intention. If the respondents have high perceived values and high trust in the process quality assurance, they will have strong purchase intention, and vice versa.

Table 4. Mapping of respondents with their purchase attitude, purchase intention, and their respective reasons

Respondent	Purchase attitude	Purchase intention	Reasons
C1	Interested	No	Quality assurance, regulatory concern
C2	Interested	Yes	Upgraded specification, affordable price, perceived quality
C3	Interested	Yes	Affordable price, upgraded specification
C4	Interested	No	Perceived quality, quality assurance
C5	Interested	No	Perceived quality, obsolescence concern
C6	Interested	Yes	Upgraded specification, perceived quality
C7	Interested	No	Perceived quality, regulatory concern
C8	Interested	Yes	Upgraded specification, perceived quality, quality assurance, affordable price
C9	Not interested	No	Quality assurance, trend concern
C10	Interested	Yes	Perceived quality, affordable price, product warranty
C11	Interested	No	Regulatory concern, perceived quality
C12	Interested	No	Perceived quality, regulatory concern
C13	Not interested	No	Perceived quality, quality assurance, regulatory concern

4.3. Discussion of findings This study aims to investigate the drivers and barriers of consumer purchase intention of remanufactured mobile phones in Indonesia. The drivers can be categorized into the economic benefit, quality benefit, social benefit, and environmental benefit, while the identified barriers are the economic risk, quality risk, and social risk. The main economic benefit is the affordable price of remanufactured mobile phones. The main quality benefit that improves consumer purchase intention is an upgraded specification. However, the contribution of the above benefits will be inadequate if the perceived quality and consumers' trust in process quality assurance are low. Furthermore, respondents indicate regulatory concern, trend concern, and obsolescence concern are the main barriers for consumer purchase intention of remanufactured mobile phones. Even though respondents acknowledge the environmental benefit of remanufacturing, this benefit does not play a significant role on the purchase intention. Familiarity with remanufacturing, especially with remanufacturing of mobile phones plays a crucial role in developing purchase intention. In this study, there is big discrepancy among respondents in terms of perceived quality and trust, which results in some respondents have adequate purchase intention and other respondents do not have the intention to purchase remanufactured mobile phones. This finding is in line with the finding of van Weelden et al. (2016) that claims product familiarity reduces perceived risk in purchasing remanufactured mobile phones. In addition, they claim users that have less confidence in their own judgment about the product quality tend to perceive a higher level of risk. On the other hand, van Weelden et al. (2016) identify warranty and service to be key determinants of the perceived risk-benefit balance when considering a remanufactured mobile phone. Our study indicates product warranty play a minor role in purchasing decision. This difference may be caused by the different settings between our study and their study. Their study is conducted in the Dutch market, where consumers can find real remanufactured products, while our study is conducted in Surabaya, Indonesia, where most people do not know what remanufactured product is. The attractiveness of affordable price in this study is also in line with the study of van Weelden et al. (2016). Their study indicates that the cheap price may have a detrimental impact as well, in that the consumers equate the cheap price with low quality. In our study, the affordable price does not have a strong impact on a certain group of consumers, especially those that focus on the trend. The other finding that is not identified by van Weelden et al. (2016) is the impact of the upgraded specification. Most of our respondents identify upgraded specification, besides affordable price, as the main attraction of remanufactured mobile phones. This difference may be caused by the fact that remanufactured phones

available in Dutch market do not have upgraded features. This study also identifies the importance of strict and clear regulation that can protect the rights of consumers. This factor is not really emphasized in the study of van Weelden et al. (2016). Perhaps the fear of counterfeit products is not as critical as in the Indonesian market.

5. Conclusion, implications, and recommendations for future research This study aims to identify drivers and barriers of consumer purchase intention of remanufactured mobile phones. Through in-depth interviews with thirteen respondents, our study identifies upgraded specification, affordable price, and product warranty to be the drivers of consumer purchase intention of remanufactured mobile phones, while the regulatory concern, trend concern, and obsolescence concerns diminish the purchase intention. High perceived quality and high trust on process quality assurance improve the consumer purchase intention, and vice versa. This study also indicates that remanufactured mobile phones have a strong appeal to consumers that focus on affordable price and upgraded features. Consumers that focus on product newness will not be interested to purchase remanufactured mobile phones. The managerial implication of this study is that remanufacturer should focus on providing phones with upgraded specification at an affordable price. The other important thing for phone remanufacturer is to provide information on how the remanufacturing process is done to their prospective consumers. The more familiar the consumers with the process, the smaller their perceived risk will be, which in turn it will increase their purchase intention. It is very urgent that the government impose strict regulation that protects consumers' rights. Otherwise, remanufacturing business will not flourish in Indonesia. There are two research limitations that we identify. First, this study was not conducted in the real market setting as in van Weelden et al. (2016). This is due to the unavailability of real remanufactured mobile phones in Indonesia. Second, we do not claim that the list of drivers and barriers is exhaustive because we did not collect enough respondents until the list saturated. Our recommendation for future research is to continue this study with a survey to identify the contribution of each factor to the purchase intention.

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