What will lead Asian consumers into circular consumption

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What will lead Asian consumers into circular consumption? An empirical study of purchasing refurbished smartphones in Japan and Indonesia

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ABSTRACT

Although smartphones are small mini-computers, their impact on the environment is no longer small. In terms of e-waste, the challenges faced by many nations in Asia, where limited recovery and recycling practices exist, include sustainable choice and consumption habits. This study investigated the factors that affect Asian consumers' behavioral intention in purchasing unbranded third-party and original equipment manufacturer (OEM)-branded refurbished smartphones, respectively. Through online surveys and analysis of a representative sample of 1200 mobile phone users in Japan and Indonesia, the findings showed that in both countries, perceived risk, consumer innovativeness, and (to some extent) price are all vital factors affecting the participation of consumers in circular consumption. The study also examined mobile phone/smartphone markets and the related legislation in Japan and Indonesia to develop field-driven hypotheses and identify the salient characteristics of the circular economy (CE) for refurbishment in both countries. In Japan, the difference in purchase intention (PI) between unbranded third-party refurbished and OEM-branded smartphones is much smaller than in Indonesia. The demand for refurbished smartphones supplied by an OEM in Indonesia is relatively higher than in Japan. The findings from this cross-cultural study can yield rich insights for CE business practitioners who seek to grasp overall patterns across the two countries and identify the salient features of each country, improving their regional marketing initiatives.

1. Introduction

Refurbishment (or refurbishing) has become a topic of dialogue among academia in the product lifetime extension area, environmental researchers interested in how the "circular economy" (CE) affects sustainability, and business managers who view CE a new market for revenue generation (Bakker et al., 2014; Morgan Stanley Research, 2017; O'Connell et al., 2013; Pamminger et al., 2021; Pearce, 2009). Refurbishment is a circular solution that enables the prolonged usage of products that have already been retired but were kept reasonably (British Standards Institution, 2009). In conjunction with recycling and other reuse options, such as remanufacturing, refurbishment can limit our rapidly growing global waste and resource consumption level (Pamminger et al., 2021).

Technically speaking, refurbishment differs from remanufacturing, although the two terms are often used interchangeably (Ijomah et al., 2011; Van Weelden et al., 2016). A refurbished product is not an as-new product but rather a product restored to a good condition through one (or all) of the following processes: cleaning, replacing, repairing defective components, and upgrading appearance (MacArthur, 2013). These processes generally result in refurbished products' lower performance specifications than new or remanufactured products (Mugge et al., 2017a; Rathore et al., 2011). In addition, refurbishment does not always ask for the complete dismantling of a product (Van Weelden et al., 2016). Hence, an opportunity occurs to bring used resources back to life while reducing the energy and labor required for related processes and subsequent production. Refurbishment usually requires less rigorous tasks towards a standard than remanufacturing (Chen and Chen, 2019), indicating a relatively lower entry barrier for (prospective) refurbishers than remanufacturers in the CE market. If the vendors are not well-prepared for more thorough and costly processes, they should

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be considered for refurbishment; they are more likely small-medium businesses in the Asian region, where limited recovery and recycling practices exist in many countries.

Concerning the features described above, the mobile phone industry is considered to be particularly well suited to refurbishment (Nasiri and Shokouhyar, 2021; Sharifi and Shokouhyar, 2021). Due to the inherent characteristics of high-tech information technology (IT) products, smartphones are purchased and replaced frequently; the average lifespan is 2.75 years in 2021 (Statistia, 2022). However, their considerable residual values for reuse by different consumer groups can represent a rich potential for refurbishment (Mugge et al., 2017a). Refurbished smartphones may appeal to the consumer segment that has never bought a new smartphone or consumers who are careful in their spending habits when considering the acquisition of a smartphone. According to the Mordor Intelligence's market report (2022), the global used and refurbished smartphone market was valued at approx. 251 million units in 2021, and it is expected increase to 459.86 million units in 2027. The current COVID-19 pandemic has pushed local demand for refurbished smartphones since the pandemic has weakened consumers' purchasing power and has impacted supply chains to delay the availability of new models (Mordor Intelligence, 2022). In line with the growth expectations for the used smartphone market (Sallomi and Lee, 2016), original equipment manufacturers (OEMs) and electronic distributors, and e-commerce players like Amazon, are currently taking a keen interest in refurbished smartphones.

In terms of material resources, mobile phones contain various critical raw materials (CRMs), neodymium (Nd), tantalum (Ta), tungsten (W), and palladium (Pd) (Charles et al., 2020) which are not for the most part, functionally recycled through today's recycling processes. Product lifetime extension, or the long-term use of mobile phones, is an effective means for curbing CRM consumption in our economy by the diffusion of mobile phone refurbishment. The recent analysis (Pamminger et al., 2021) demonstrates that the refurbishing scenario shows excellent potential as a CE strategy for smartphones in terms of global warming and resource depletion potential impacts.

Like in Western societies, in Asian economies, to a greater or lesser extent, closed-loop production patterns have been constructed to accommodate regulatory initiatives that have been implemented in recent decades; for instance, the Basic Act on Establishing a Sound Material-Cycle Society (2000) and the Circular Economy Vision for 2020 (2020) in Japan, the Resource Sustainability Act (2019) in Singapore, the Extended Producer Responsibility scheme (2003) and the Basic Law on Resource Circulation (2018) in South Korea, and national CE master plans for waste management in emerging Asian economies like Vietnam and Thailand (Hai et al., 2020; Wichai-utcha and Chavalparit, 2019). These CE-driven pressures indicate that companies must ensure that their consumers are in an environment characterized by accepting second-life products such as refurbished smartphones. A competitive CE market is consumer-oriented (Cherry et al., 2018; Nasiri and Shokouhyar, 2021; Parajuly et al., 2020). Enhancing consumer acceptance is a continuing challenge for corporate managers who view the CE as a commercially viable model for their companies (Esmaeilian et al., 2021). While refurbishment practices have been primarily implemented in business-to-business applications (e.g., photocopiers), the consumer perspective remains unexplored (Van Weelden et al., 2016).

The recent CE literature has shifted its focus from strategic and operational aspects (Atasu et al., 2008; Guide and Li, 2010; Liang et al., 2009; Subramanian and Subramanyam, 2012) to marketing issues, providing insight into consumers' perceptions and purchasing behaviors (Agostini et al., 2021; Boyer et al., 2021; Khor and Hazen, 2017; Korsunova et al., 2021; Mugge et al., 2017a; Nasiri and Shokouhyar, 2021; Parajuly et al., 2020; Van Weelden et al., 2016). Asia is experiencing rapid economic growth and an increase in population. We can easily imagine very soon (or perhaps, the present) massive consumption growth in the Asian region, implying that there are both challenges and opportunities for circular initiatives. With this study, thus, we targeted two Asian countries to understand their motivations and behavioral intention towards refurbished smartphones: Japan, a highly developed country, and Indonesia, a country currently experiencing rapid growth in the young population and urbanization boosted consumer spending. The diversity of cultural backgrounds and standards in Asia may produce marked differences in market situations among the region's countries. This study contributes by cross-country comparisons to yield deeper insights for CE business practitioners looking for common patterns (if any) in the area and assessing the salient features of individual nations.

Prior research has provided empirical evidence of the effect of several factors on consumers' green purchasing behavior. The present study evaluated whether factors that have been identified previously as being critical for refurbishment could promote the expansion of the market for refurbished smartphones in Asia. These factors, including the perceived risk of a refurbished smartphone and an individual's perception and attitude towards price, environment, and innovation, can explain Asian consumers' behavioral intention to purchase a refurbished smartphone (see details in Section 2.1).

We consider two scenarios where consumers purchase refurbished smartphones with identical specifications, technical characteristics, and warranties but with different manufacturers and prices. Specifically, the one is the refurbished smartphone provided by an OEM. Another refurbished smartphone is provided by a third-party manufacturer, referred to hereafter as a third-partys refurbished smartphone. This setting allows us to assess whether the aforementioned factors affect the behavioral intention in purchasing un-branded third-partys and OEM-branded refurbished smartphones, respectively. Additionally, through a questionnaire survey, we asked individuals how much they would agree to buy the latest (and generally expensive) new smartphone and compared their responses to their purchasing intention towards refurbished smartphones.

The study also explored the mobile phone/smartphone markets and CE-related legislation in the two countries. In doing so, we sought to understand country-specific information better and develop field-driven hypotheses to identify the salient features of each country(see details in Section 2.2).

2. Literature review

2.1. Theoretical backgrounds and hypotheses development

Understanding consumers' purchase behavior is complicated (Roozmand et al., 2011). Previous research has investigated this complex issue from various angles (Groening et al., 2018). The theory of planned behavior (TPB) (Ajzen, 1991) is one of the dominant theories in the literature related to pro-environmental behavior (Botetzagias et al., 2015; Groening et al., 2018). The TBD suggests that an individual's intention, an essential trigger in performing a specific behavior (e.g., purchasing), can be predicted from attitude, subjective norms, and perceived behavioral control and that actual behavior is the result of this intention (Ajzen, 1991). Many research has identified the effect of this theory on the behavior related to closed-loop supply chain products (Botetzagias et al., 2015; Groening et al., 2018; Parajuly et al., 2020). For instance, The TPB has been used to study determinants influencing consumers' purchase intention (PI) of remanufactured products in various cultural contexts (Jiménez-Parra et al., 2014; Le et al., 2013; Wang et al., 2013). However, no intention always translates to actual behavior; it is often pointed out that the TPB may not predict the complexity of green consumer behavior (Groening et al., 2018).

Suppose we view the TPB as one of the psychological theories (Esmaeilian et al., 2021); economic theories that focus on external conditions such as price and socio-economic characteristics can also explain consumers' pro-environmental behavior (Clark et al., 2003). Studies suggest that various factors can analyze consumers' behavior in

purchasing refurbished products (Esmaeilian et al., 2021). They may include cleanliness and the incentives that guarantee continued performance (Mugge et al., 2017a), technological obsolescence (Esmaeilian et al., 2021), seller reputation (Agostini et al., 2021), refurbished product features (Sharifi and Shokouhyar, 2021), etc.

This study examined whether, and if so, how the four factors of the perceived risk (PR) of a refurbished smartphone, price consciousness (PC), environmental consciousness (EC), and innovativeness (IN) affect consumers' intentions to purchase a refurbished smartphone. These factors are rather traditional determinants, as previous research has addressed, and they are confirmed in the European consumer market (Mugge et al., 2017a). However, it is still questionable whether these factors can increase the adoption of refurbished smartphones for all consumers. This paper attempts to offer some insights into cultural factors specific to Asian culture for the consumer market of refurbished smartphones by examining these four factors for cross-cultural analysis in two countries. This section discusses previous studies on these four factors and purchasing behaviors towards CE-centric products, including refurbished products, and introduces the hypothesis related to these factors.

2.1.1. Perceived risk of a refurbished smartphone

Since the introduction of the PR concept in the marketing literature (Bauer, 1960), PR is at play in consumers' purchasing behaviors. PR is defined as "a combination of uncertainty plus seriousness of outcome involved" (Bauer, 1960, p.391), and "the expectation of losses associated with a purchase and acts as an inhibitor to purchase behavior" (Peter and Ryan, 1976, p.1). Such a risk has various dimensions (Cunningham, 1967; Grewal et al., 1994; Jacoby and Kaplan, 1972; Peter and Ryan, 1976; Zikmund and Scott, 1974). In the remanufacturing literature, for instance, Wang et al. (2013) identified six dimensions of risk, including financial, performance, social, physical, time, and resource, related to purchasing remanufactured products. The present study considered the four types of risk - physical, performance, financial, and time that have been addressed in the existing literature (Matsumoto et al., 2018; Van Weelden et al., 2016; Wang et al., 2013) and used them as components of consumers' PR related to purchasing refurbished smartphones.

Compared to a new product, consumers' perceptions of CE-centric products like remanufactured products are uncertain in terms of quality, value, and performance (Hazen et al., 2017a.; Van Weelden et al., 2016; Wang and Hazen, 2016). Thus, the PR of consumers is typically higher when purchasing a remanufactured product than a new one (Confente et al., 2021).

Scholars have demonstrated that PR is a significant hurdle for consumers when buying remanufactured products (e.g., Matsumoto et al., 2018; Singhal et al., 2019; Wang and Hazen, 2016). Van Weelden et al. (2016) posited that balancing consumers' PR with the perceived benefits in the decision-making process is vital in the refurbishment context. They argued that consumers could reject a refurbished smartphone if the PR outweighs the perceived benefits. Agostini et al. (2021) also showed that PR significantly affected the purchase intention of refurbished smartphones. Mugge et al. (2017a) reported a significant negative effect of perceived performance risk on refurbished smartphone purchases among the various risk categories. Overall, our literature review suggests that high PR levels hinder consumers' adoption of refurbished smartphones. We, therefore, propose the following hypotheses:

H1(a). The PR of a refurbished smartphone negatively influences the intention of consumers to purchase a refurbished smartphone provided by an OEM in Japan and Indonesia.

H1(b). The PR of a refurbished smartphone negatively influences the intention of consumers to purchase a refurbished smartphone provided by a third party in Japan and Indonesia.

2.1.2. Price consciousness

Price consciousness is "the degree to which the consumer focuses exclusively on paying a low price" (Lichtenstein et al., 1993, p.235). Price consciousness can vary between individuals, but it also depends on product groups and situations, even for the same individual (Lichtenstein et al., 1988). Given that smartphone replacement is both frequent and expensive, consumers is more conscious of price when shopping for a smartphone. Price-conscious consumers are therefore likely to try and obtain a better price, i.e., to find the lowest possible price for their target product (Alford and Biswas, 2002). Typically, remanufactured or refurbished products are priced at least 30 % lower than a new product (Mugge et al., 2017a; Wang et al., 2013). During the product search process, price-conscious consumers are more likely to be exposed to alternative products, leading to a higher perception of refurbished products' financial benefits (i.e., lower prices). Such consumers are, therefore, more likely to purchase them. However, we should note that the desire for a lower price is not necessarily related to a consumer's PI or action. Although a competitive price is undoubtedly a factor when buying a refurbished product, because low prices may create doubts about product quality (Van Weelden et al., 2016).

The remanufacturing literature has examined the influence of consumers' PC on purchasing electronics and spare automobile parts. Sundin et al. (2008) identified consumers' higher PC as a potential reason for higher sales of remanufacturing in the US compared to Sweden. Similarly, Matsumoto et al. (2017) compared American and Japanese consumers' perceptions of the price of remanufactured auto parts. They argued that Japanese consumers' relatively lower concerns about price could be a barrier to the growth of the remanufacturing market in Japan. Further, Matsumoto et al. (2018) confirmed that PC positively influences consumers' PI towards remanufactured products. Thus, we posit the following hypotheses:

H2(a). Price consciousness positively influences the intention of consumers to purchase a refurbished smartphone provided by an OEM in Japan and Indonesia.

H2(b). Price consciousness positively influences the intention of consumers to purchase a refurbished smartphone provided by a third party in Japan and Indonesia.

2.1.3. Environmental consciousness

Due to public concerns about environmental issues and the increase in environmental protection activities in recent decades, consumers have become more environmentally conscious (Eurobarometer, 2009; Eurobarometer, 2013; Hueber, 1991; Nielsen, 2013). Businesses have responded to consumers' growing environmental concerns by developing eco-friendly products (Kohl, 1990) and practicing green marketing strategies (Jain and Kaur, 2004). According to Schlegelmilch et al. (1996), EC can reshape consumer habits in ways that minimize their impact on the environment. These habits include consumption behaviors such as deciding whether and what to consume (Ritter et al., 2015). Consumers who are more environmentally conscious are more willing to adapt their choices or purchase behaviors in an environmentally friendly manner (Lin and Huang, 2012).

Studies on the consumption of remanufactured/refurbished products showed that consumers' environmentally conscious attitudes, green knowledge, or perception of environmental benefits related to those products were often viewed as positive factors influencing their buying behavior (Harms and Linton, 2016; Jiménez-Parra et al., 2014; Mugge et al., 2017a; Singhal et al., 2019; Wang and Hazen, 2016). We might surmise that a high level of EC and related attitudes could affect consumers' intentions and behaviors to purchase green products (Kim and Choi, 2005; Laroche et al., 2001; Lin and Huang, 2012). However, this notion should be interpreted with caution as, in some cases, environmental attributes were found to play a relatively minor role in consumer decision-making (Michaud and Llerena, 2011; Van Weelden

et al., 2016). For example, other studies have shown that consumers' pro-environmental attitudes did not always have a real-world impact (Gupta and Ogden, 2006; Wong et al., 1996). Thus, the relationship between EC and PI requires further clarification (Hazen et al., 2017b). Thus, we posit the following hypotheses:

H3(a). Environmental consciousness positively influences the intention of consumers to purchase a refurbished smartphone provided by an OEM in Japan and Indonesia.

H3(b). Environmental consciousness positively influences the intention of consumers to purchase a refurbished smartphone provided by a third party in Japan and Indonesia.

Previous studies have attempted to define and characterize environmentally conscious consumers. In the present study, referring to Kikuchi-Uehara et al. (2016), behavioral intention, response efficacy, environmental responsibility, perceived behavioral control, and perception of threat, were selected as variables for defining and assessing respondents' level of EC.

2.1.4. Innovativeness

Today, the term "innovativeness" is pervasive in the global economy, but we have not yet reached a consensus on its exact definition (Lala and Tănase, 2014; Roehrich, 2004). In the consumer research domain, IN is often measured by how much earlier one individual adopts a new product or idea compared to the average individual (Rogers, 2003). Inspired by Rogers's innovation adopter categories (2003), this study defines consumer IN as the tendency to adopt and buy a new product or service earlier than others.

The degree of consumer IN positively affects innovation adoption behavior (Arts et al., 2011; Huang et al., 2011; Rogers, 2003; Wang et al., 2008). Thus, a refurbished smartphone that is not the latest (and by inference, the most innovative) model might not appeal to early adopters. Mugge et al. (2017a) found that consumer IN negatively affected PI for a refurbished smartphone. Thus, we hypothesize:

H4(a). Consumer innovativeness negatively influences the intention of consumers to purchase a refurbished smartphone provided by an OEM in Japan and Indonesia.

H4(b). Consumer innovativeness negatively influences the intention of consumers to purchase a refurbished smartphone provided by a third party in Japan and Indonesia.

2.2. Review of the CE market and related legislation in both countries and hypothesis development

This section reviews the interviews conducted with repair/reuse businesses and retailers in both countries, summarizing our observations about current market conditions and legislation for refurbished and used smartphones. Based on these findings, we developed country-specific hypotheses to predict consumer purchase behaviors related to refurbished smartphones.

2.2.1. Japan

Japanese people tend to have high rates of mobile phone usage. For example, Japan has 147 subscribers per 100 people (World Bank, 2019), while the average of 161 countries was approximately 112.32 per 100 people (the Global Economy, 2020). In 2019, the penetration rate of smartphones in Japan was as high as 57.2 %, which according to Newzoo's 2019 global mobile market report, ranked among the world's top 10. Smartphone usage in Japan is growing, and the fact that feature phones are still popular is unique compared to other developed countries (Insider Intelligence, 2018).

Approximately 30 million mobile phones are sold annually in Japan. In 2020, an estimated 2 million secondhand mobile phones were sold in Japan, significantly increasing from the approximately 500,000 sold in 2009 (MM Research Institute, 2021). However, refurbished mobile phones were rarely traded on the domestic market. Most discarded phones are collected by telecommunications companies or kept by users, with the latter disposal route being predominant. When used mobile phones are returned to telecommunications companies, they are processed in three ways. They are either: (1) disassembled by a contracted mobile phone repair company and their components used for repairs; (2) recycled; or (3) exported overseas after erasing their data. According to the interviews, repair/reuse business companies typically send these mobile phones abroad, suggesting that resale abroad is a cost-effective strategy. We consider that the outlook for repair/reuse has not been favorable to date and that Japanese consumers' acceptance of refurbished smartphones is low. Therefore, we hypothesize that the PI of Japanese consumers for refurbished OEM or third-party smartphones is lower than it is for the latest smartphone.

H5(a). Japanese consumers' PI for a refurbished smartphone provided by an OEM is lower than for the latest smartphone.

H5(b). Japanese consumers' PI for a refurbished smartphone provided by a third-party manufacturer is lower than for the latest smartphone.

We identified the following regulatory burdens and pricing schemes that might have hampered refurbishment practices in the Japanese market. Although these restrictions have been eased gradually, the Radio Act of Japan discouraged companies from running mobile phone repair or refurbishing businesses. It was unclear whether the repairs on mobile phones were legal. Since 2007, when the law was amended, regulations on phone repairs have been relaxed and certified companies are now allowed to repair and refurbish mobile phones. Becoming certified is costly and time-consuming, suggesting another challenge for companies. However, the amendment might indicate that the government intends to reduce the regulatory burdens placed on firms that wish to enter the CE market.

Another drawback of the CE mobile phone business in Japan was the pricing systems implemented by telecommunications companies. Telecommunications companies previously offered substantial discounts on new phones; sometimes, a new smartphone was included in the price of a new account with a telecoms carrier. Consequently, consumers were not incentivized to buy low-priced mobile phones, including a secondhand or refurbished model. People who continuously used old phones were not entitled to such discounts, which eventually hindered the prolonged usage of phones. Although similar packages based on such pricing schemes exist in other countries, including the US, the UK, France, Germany, and South Korea, the number of product discounts offered by telecommunications companies is the largest in Japan and Korea (Aucnet Research Institute, 2019). In 2019, the government revised the Telecommunications Business Act, separating mobile device costs from usage charges and banning discounts on new phone purchases. Not only will this enable customers to compare each company's communication fees more quickly, but price-conscious consumers will be more inclined to seek out low-end phones, including refurbished options.

The reduced burdens on product repair and refurbishment and revised pricing suggest that the market outlook for second-life phones, like refurbished smartphones now, depends on consumer choices.

2.2.2. Indonesia

Indonesia has the fourth-largest population worldwide, with 270.6 million inhabitants as of 2019 (World Bank, 2019). The number of mobile phone users is increasing rapidly. For example, there are 355.6 million mobile subscriptions, or approximately 130 % of the population in 2020, which implies that some mobile phone users have multiple contracts (The World Bank, 2021a; The World Bank, 2021b). The high number of mobile phone users is not limited to urban areas. At the end of 2018, 69.6 % of the urban population and 53.6 % of the rural population

owned a mobile phone (Badan Pusat Statistik, 2019). The annual sale of smartphones was around 39 million in 2019, and there was a significant increase in the third quarter of 2019, when smartphone shipments totaled 11.5 million, compared to 8.9 million for the same quarter in 2018 (Canalys, 2019). Considering smartphones have a relatively short lifecycle, this rapid growth suggests that Indonesia will encounter an e-waste problem soon.

The market for secondhand smartphones is well developed in Indonesia, and consumers can easily find both physical and online stores for secondhand devices. The supply volume from consumers is also considerable, as consumers typically sell their used smartphones instead of discarding them in Indonesia (Andarani and Goto, 2014; Rimantho et al., 2014; Safa'at et al., 2019). Furthermore, the demand for secondhand smartphones is relatively high, especially during the holiday season (e.g., New Year). Many consumers consider purchasing a secondhand smartphone a viable option as it allows them to access superior features on a limited budget.

There is currently no mobile/smartphone remanufacturing or refurbishment by third parties in Indonesia. Consumers can only buy refurbished smartphones legally from an online OEM store (such as the Apple Store) or when an OEM rebrands refurbished smartphones (such as in the case of the Samsung Galaxy Note 7 that was recalled from the global market, refurbished, and then rebranded as the Galaxy Note FE before being sold on the market). The retailers stated that refurbished premium smartphones would be attractive for Indonesian consumers; because premium smartphones from popular brands are in demand, but the price is frequently too high for many Indonesian consumers. As mentioned above, Indonesians' sense of familiarity and experience with purchasing a secondhand smartphone, including an OEM's refurbished ones, and their aspirations to own branded premium phones at an affordable price are likely to lessen their aversion to OEM's refurbished smartphones. Such a scenario is seldom observed in the Japanese market. Accordingly, we formulated the following hypothesis.

H6. Indonesian consumers' PI for an OEM's refurbished smartphone is higher than that of Japanese consumers.

Based on Indonesian regulations, importing refurbished smartphones for direct sale is prohibited, but refurbishment companies can import previously owned smartphones as capital goods and process them into a final product. Since the highest demand is for refurbished premium smartphones originating from abroad, targeting premium models could present an opportunity for local refurbishers. Nonetheless, local (third party) refurbishers are too small to expand their refurbishment practices to cover smartphones. Domestic smartphone manufacturers are reluctant to participate in the refurbishment business due to concerns, such as the cannibalistic effect that this could have on new products, the lack of supply of used products, and the fear of damaging brands.

The limited recovery and recycling practices in Indonesia raise serious concerns about the environmental burden associated with such activities, as the volume of smartphones circulating in the country is considerable. There is no robust take-back policy for producers; instead, the environmental protection regulations provide incentives for producers whose actions favor ecological protection. Our market review found that Indonesian consumers showed a low enthusiasm for sending their discarded phones to recycling facilities (Budijati, 2017; Junianto and Sugandha, 2019). When the core acquisition price is low, they would rather keep their old phones at home (Maheswari et al., 2018).

In summary, the potential demand for refurbished smartphones, particularly branded ones, is promising, and shifting consumer preferences from the secondhand to the refurbished market is considered possible in Indonesia. However, before such initiatives are implemented, a better understanding of consumers' choices might benefit the execution of strategies for advancing Indonesia's phone refurbishment business.

3. Methods

3.1. Sampling and questionnaire survey

An online questionnaire survey was conducted in November 2019 to assess consumers' perceptions and intentions regarding purchasing low-cost, refurbished, and new, high-cost smartphones in Japan and Indonesia. The surveys were conducted by a survey agency commissioned to perform the fieldwork. A total of 600 complete and valid responses were obtained for each country. We controlled each survey to require stratified random samples by age and gender. Table 1 lists the demographic profiles of the samples, including respondents' cell/smartphone usage-related statistics.

All respondents owned a mobile phone, including smartphones, and more than half had used their current phone for fewer than two years. While nearly 86 % of Japanese respondents had no experience selling their used smartphones, more than half of the Indonesian respondents had previously sold their used phones; this finding was expected based on the market reviews.

The questionnaire consisted of two parts. The first part described items related to respondents' demographic and socio-economic profiles and statistics on their smartphone usage (the entire questionnaire is available as Supplementary Material 1). The second part included items pertinent to PI and the variables (the four mentioned earlier, PR, PC, EC, and IN) that could influence consumers' PI for refurbished smartphones.

Table 1
Profile of the survey sample.

Characteristics	Japan	Indonesia
Age (y)		
<15	0 (0)	0 (0)
15–19	100 (16.7)	100 (16.7)
20–29	100 (16.7)	100 (16.7)
30–39	100 (16.7)	100 (16.7)
40–49	100 (16.7)	100 (16.7)
50–59	100 (16.7)	100 (16.7)
60–69	81 (13.5)	93 (15.5)
≥70	19 (3.2)	7 (1.2)
Location		
Center of metropolitan area	149 (24.8)	288 (48.0)
Local city area	145 (24.2)	172 (28.7)
Suburb of metropolitan area	204 (34.0)	87 (14.5)
Rural area	102 (17.0)	47 (7.8)
Others	0 (0.9)	6 (1.0)
Income level*		
1	156 (26.0)	145 (24.2)
2	133 (22.2)	96 (16.0)
3	112 (18.7)	109 (18.2)
4	86 (14.3)	40 (6.7)
5	56 (9.3)	29 (4.8)
6	28 (4.7)	50 (8.3)
7	11 (1.8)	34 (5.7)
8	18 (3.0)	97 (16.2)
Period using their current phone		
<1 year	167 (27.8)	133 (22.2)
1–2 year(s)	154 (25.7)	191 (31.8)
2–3 years	100 (16.7)	134 (22.3)
3–4 years	62 (10.3)	54 (9.0)
≥4 years	117 (19.5)	88 (14.7)
Experience selling a used phone		
No	514 (85.7)	275 (45.8)
Yes	86 (14.3)	325 (54.2)
Total sample	600	600

Japan: <3, 3–4.99, 5–6.99, 7–8.99, 9–10.9, 11.0–12.99, 13–14.99, >15 (unit: million Yen).
Indonesia: <30, 30–59, 60–89, 90–104, 105–119, 120–134, 135–149, >150 (unit: million Indonesian Rupiah).
Values in brackets indicate the percentage of each characteristic in the sample.
* Income levels for each country are as follows.

3.2. Operationalization

The consumer's PI is a measure of the likelihood that an individual will purchase a particular category of smartphone in the future. The following two-item scale measured PI. Item PI-1 examined the situation where consumers would buy a specific smartphone, while Item PI-2 examined the case where consumers recommended a specific smartphone to an acquaintance. The term "specific smartphone" refers to one of three categories: a refurbished smartphone provided by an OEM, a refurbished smartphone by a third-party manufacturer, or the latest new model. Respondents indicated their level of agreement or disagreement with two items using a seven-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7).

Before obtaining an individual's response to each item, the questionnaire briefly described the three smartphone categories and how they were different in terms of price and features. The two items used the existing measures from Wang et al. (2013) but were partially adapted to our model context when necessary. We estimated the PI for each smartphone category from the average score of the two-item scale (PI-1 and PI-2).

We also assessed respondents' level of agreement with 15 additional items related to the views and beliefs constructing the four factors (constructs), PR, PC, EC, and IN. For each item, we used a seven-point Likert scale. The items were primarily motivated by previous studies; PR (Matsumoto et al., 2018; Wang et al., 2013), PC (Matsumoto et al., 2018), EC (Kikuchi-Uehara et al., 2016), and IN (Filová, 2015). The entire questionnaire is provided in Supplementary Material 1.

The questionnaire's internal validity was evaluated via the Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity tests. For both countries, the KMO values overcome the limit of 0.7 and the significance of Bartlett's Test of Sphericity is 0.000, indicating that the original items are suitable for factor analysis. Then, we used Cronbach's α to evaluate the consistency of the items for each factor. Cronbach's α values were >0.85, indicating that the scale's reliability was quite good (see Tables S-1 and S-2 in Supplementary Material 2 for details).

3.3. Method of analysis

Since the study's main aim was to examine whether and how the four factors could impact Asian consumers' circular PI, we performed ordinary least squares (OLS) regression analysis. We focused on the relative, rather than absolute, PI for refurbished smartphones and defined the objective variable for PI as 'changes in PI between refurbished and the latest new smartphones' (hereafter, relative PI for refurbished smartphones). The hypotheses H1(a), 1(b); H2(a), 2(b); H3(a), 3(b); and H4(a), 4(b) were tested by regressing the relative PI for (OEM's- and third party's) refurbished smartphones on the four factors. In addition, we used a heteroscedasticity-consistent standard error estimator (Hayes and Cai, 2007; White, 1980) to avoid inefficient standard error estimates when heteroscedasticity is present.

H5(a) and 5(b) describe our research's need to compare the (absolute) PIs for refurbished smartphones with the latest model in the Japanese market. We applied a one-way layout analysis of variance (ANOVA) to test the differences in Japanese consumers' PI among the latest new smartphones, OEM's refurbished smartphones, and third-partys refurbished smartphones while holding the probability of the Type 1 error. We verified the differences in PIs for pairs of each of the refurbished smartphones with the latest new model by multiple comparison tests with repeated samples after performing the ANOVA under the null hypothesis that the means of all PIs are the same.

To address hypothesis H6, we compared the relative PI for an OEM's refurbished smartphone across Japan and Indonesia. This comparison used Welch's *t*-test, as Welch's t-test controls Type 1 error rates when the assumption of equal variances is not met (Delacre et al., 2017).

We broke down the outcome based on the purchasing power parity (PPP)-based (household) income to check the robustness of the results (e.g., H1-H4) and to compare the two countries carefully (e.g., H6). The sample was also split into two age groups: ages 15–59 and ages 60 or over, given the generation gap that exists in smartphone adoption and usage (e.g., H1-H6).

4. Results

Table 2 presents the regression results of the PI for OEM's- and third-partys refurbished smartphones in Japan and Indonesia.

Table 2 shows that the PR of refurbished smartphones and IN significantly and negatively influence Japanese and Indonesian consumers' relative PI for both refurbished smartphones. The PC significantly affects the relative PI for an OEM's refurbished smartphone in both countries. While a significant positive effect is observed for PC for the third-partys refurbished smartphone purchases in Indonesia, no such effect is for the third-partys model in Japan. The EC is positively related to OEM's refurbished smartphone purchases only in Japan ($p < 0.1$). However, the result also shows a negative relationship between EC and the relative PI for a third party's refurbished smartphone in Indonesia ($p < 0.001$). Therefore, H1(a), 1(b), 2(a), 4(a), 4(b) are supported, but H2(b), 3(a), and 3(b) are not.

We split the responses into four subsamples; respondents who are 15–59 years old and those who are over 60 years old, with annual household incomes below PPP USD 29,000 and over PPP USD 29,000, and tested the PI models for those subsamples. The analysis produces consistent results across both countries, as the robustness checks do not lead to sign changes in the variables' coefficient values for refurbished smartphone purchases (please see especially PR, PC, and IN Tables S-3 and S-4 in Supplementary Material 2).

Table 3 represents the mean and the standard deviation of the absolute PI for a specific smartphone category per country. As noted earlier, the PI is given by the arithmetic means of consumers' responses to the two-item scale, PI1 and PI2.

There are differences in PI for three categories of smartphones, with a higher mean PI for the latest smartphone than for refurbished smartphones. The results also show some differences in PI for the same smartphone category by country.

Table 4 shows the ANOVA results comparing the mean Japanese consumers' PI on smartphone categories. As predicted by H5(a) and 5(b), Japanese consumers' PI is lower for both OEM's refurbished smartphones (3.372) and third party's smartphones (3.185) compared to the latest new smartphones (3.662).

Subsample tests confirm these comparisons, except for the over 60s group (see details in Table S-3 in Supplementary Material 2). Thus, H5(a) and 5(b) are supported by consumers under the age of 60 years old.

Table 5 shows the differences between the relative PI values obtained for an OEM's refurbished smartphone in the two age groups (i.e., 15–59 years old and ≥ 60 years old) in both countries. The consumer's PI for OEM's refurbished smartphones is always significantly higher in Indonesia than in Japan, supporting hypothesis H6.

5. Discussion

The OLS regression results show that the demand for refurbished smartphones is strongly related to PR, as has also been noted in other studies (e.g., Wang and Hazen, 2016; Matsumoto et al., 2018). Our results highlight the importance of enhancing consumers' trust in the quality of refurbished smartphones in Asian markets like Japan and Indonesia, irrespective of who sells the refurbished smartphone.

The respondents from both countries showed that more price-conscious consumers are more likely to buy an OEM's refurbished smartphone than buy either a new one or a third-partys refurbished one. However, in Indonesia, price could drive demand for a third-partys refurbished smartphone ($\beta = 0.312$, $p < 0.001$). As reported in

Table 2
Results of heteroscedasticity-consistent OLS regression analysis for refurbished smartphone purchases.

	Dependent variable: $\Delta PI_{OEM,i}$, ($N = 600$)		Dependent variable: $\Delta PI_{3rd,i}$, ($N = 600$)	
i	Japan	Indonesia	Japan	Indonesia
Variable	Coefficient estimates (Standard Errors)			
PR	−0.357*** (0.078)	−0.542*** (0.070)	−0.339*** (0.081)	−0.447*** (0.068)
PC	0.164** (0.083)	0.243*** (0.064)	0.142 (0.089)	0.312*** (0.060)
EC	0.121* (0.073)	0.070 (0.084)	0.027 (0.073)	−0.222*** (0.082)
IN	−0.229*** (0.063)	−0.255*** (0.065)	−0.162** (0.065)	−0.332*** (0.064)
Income	−0.0005** (0.000)	−0.005* (0.003)	−0.001*** (0.000)	−0.003 (0.003)
Age	0.014*** (0.004)	−0.006 (0.006)	0.010** (0.004)	0.006 (0.005)
Constant	0.424 (0.455)	1.954*** (0.423)	0.669 (0.469)	1.571*** (0.424)
R^2	0.125	0.199	0.098	0.246
Pr > F	0.000	0.000	0.000	0.000
White test: Pr > Chi^2 (27)	0.000	0.028	0.000	0.043

$\Delta PI_{OEM} = PI_{OEM} - PI_{NEW}$, $\Delta PI_{3rd} = PI_{3rd} - PI_{NEW}$.
PI_{OEM}: purchase intention for OEM's refurbished smartphones, PI_{3rd}: purchase intention for third party's refurbished smartphones, PI_{NEW}: purchase intention for the latest new smartphones.
PR: perceived risk, PC: price consciousness, EC: environmental consciousness, IN: innovativeness.
Household income is expressed as 100 USD.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.001$.

previous studies (e.g., Guide and Li, 2010; Jiménez-Parra et al., 2014), one significant benefit of a refurbished product is the lower price. A low-price strategy that targets price-sensitive consumers is thus feasible in the Asian market, especially in Indonesia.

However, such a low-price strategy may not work well in Japan (no relationship between PC-PI_{3rd}). One reason for this may be because Japanese consumers typically associate lower prices with inferior product quality (Barrager, 1993; Melville, 2012; Moriuchi, 2016), leading to Japanese consumers generally eschewing cheap goods (Salsberg, 2010). Japanese consumers have long been regarded as being prepared to pay more for quality products with a known brand (Synodinos, 2001).

There is some disagreement in the literature regarding the relationship between EC or green knowledge and green product PI (Wang et al., 2013). Our findings exhibited a positive relationship only between EC and the PI of Japanese respondents for OEM-branded refurbished smartphones. The same relationship was not observed for the other respondents and smartphone categories that were analyzed. Indonesian consumers with a higher level of ecological awareness were more reluctant to buy a third-party refurbished model ($\beta = -0.222$, $p < 0.001$). Potential trust concerns towards the processes employed by third parties might have contributed to this negative effect on PI. Indeed, our reviews found no remanufacturing or refurbishment activities by third-party manufacturers in Indonesia, which means that consumers would have had few opportunities to spot any processes to assess whether those were green or not. Thus, independent refurbishers and retailers who consider becoming active in refurbishing smartphones need to build consumer trust to show that their operations will not damage the environment and that their refurbished goods are green.

Our regression analysis results corroborate previous findings (Mugge et al., 2017a) and show that more innovative consumers prefer the latest smartphone over refurbished smartphones. Here, IN refers to seeking to purchase recently created functions or upgraded features that those people never experienced before. To some extent, integrating with innovative parts or introducing a new component is possible within refurbished smartphones (Ganter et al., 2021). However, additive refurbishment for smartphones may be an unattractive alternative for innovators and early adopters who are highly IT technology-conscious and thrilled with the newness. Instead, that may benefit consumers who want to try out new technologies but have a limited budget.

The absence of innovative features in refurbished smartphones appeals to some consumers who experience fatigue from the complexity of new smartphones (Van Weelden et al., 2016). Indeed, we often need to learn or change our behavior when encountering a new model, and refurbished smartphones allow consumers to avoid doing so. Thus, it may be worth considering targeting those consumers who

Table 3
Consumers' PI for different smartphones in Japan and Indonesia.

Model	Model type	Country	PI: Mean (s.d.)
I	The latest expensive new one	JPN	3.662 (1.496)
		IDN	5.179 (1.752)
II	OEM's refurbished one	JPN	3.372 (1.264)
		IDN	4.106 (2.069)
III	3rd party's refurbished one	JPN	3.185 (1.306)
		IDN	3.033 (1.847)

PI: purchase intention, JPN: Japan, IDN: Indonesia.

Table 4
Comparison of differences in PI for smartphones among Japanese consumers ($N = 600$).

Categories	The presence of differences between categories	Difference	*p*
PI_{OEM} PI_{NEW}	Yes	−0.290	0.001
PI_{3rd} PI_{NEW}	Yes	−0.477	0.000
PI_{OEM} PI_{3rd}	Yes	−0.187	0.059
F value	18.74	$p > F$	0.000
Chi-Square (2)	19.537	$p >$ Chi-Square	0.000

p is the difference probability by Scheffe's multiple comparison test.
PI_{OEM}: purchase intention for OEM's refurbished smartphones, PI_{3rd}: purchase intention for third party's refurbished smartphones, PI_{NEW}: purchase intention for the latest new smartphones.

Table 5
Difference between the relative PI for OEM's refurbished smartphones in Japan and Indonesia.

	Mean (s.d.)	t-value	N	Mean (s.d.)	t-value	N
Income below PPP USD 29,000						
Age (y)	15–59			+ 60		
JPN	−0.424 (1.617)		118	0.382 (1.784)		38
IND	−0.939 (2.288)	−2.735***	393	−0.553 (2.110)	−2.477**	76
Income over PPP USD 29,000						
Age (y)	15–59			+ 60		
JPN	−0.393 (1.623)		382	0.185 (1.818)		62
IND	−1.780 (2.581)	−5.277***	107	−1.771 (2.075)	−4.056***	24

Results are adjusted by Welch approximation.
PPP: purchasing power parity, JPN: Japan, IDN: Indonesia.
*** $p < 0.01$.
** $p < 0.05$.

pursue new technology at reduced costs and less-innovative consumers who prefer to have stable and legacy systems.

Our results, which supported hypotheses H5(a) and 5(b), showed that Japanese consumers (below 60 years old) are less likely to buy refurbished smartphones than they prefer the latest models. The lower PI for refurbished smartphones is acceptable as there has been so far no clear (even economic) incentive for Japanese consumers (see Section 2.2.1). Even looking at the existing literature, the lower PI for refurbished smartphones compared to new smartphones is also not surprising (Guide and Li, 2010; Harms and Linton, 2016; Michaud and Llerena, 2011). However, compared to the Indonesian case (1.073), the difference in the magnitude of the PI of Japanese consumers (0.187) between OEM's- and third party's refurbished smartphones is smaller ($t(1198) = -11.440$, $p < 0.001$). This could be encouraging for independent refurbishers in Japan because it suggests that there is room to increase the relatively lower PI level for third-partys refurbished smartphones to a PI that is comparable with that of OEM's refurbished products. In other words, once Japanese consumers have a positive impression of refurbished smartphones, they are unlikely to be more brand-conscious than Indonesian consumers.

Our subsample tests found that the attitudes of older Japanese consumers towards purchasing refurbished smartphones differed from those of the younger generation. According to the Cabinet Office's report (2019), while younger generations consider attributes such as price or quality, older generations tend to pay less attention to price and quality. Older generations also show a tendency to buy more secondhand products. Thus, marketing to each generation will be required to motivate Japanese consumers to purchase refurbished smartphones.

We found a difference in the PI for refurbished smartphones from OEM in Japan and Indonesia. Compared to Japanese consumers, Indonesian consumers show more favorable behavioral intentions to purchase refurbished smartphones from OEM. As described in Section 2.2.2, the marketplace for secondhand products is relatively well developed in Indonesia, so the concept of refurbished smartphones is not awkward to them. Indeed, this familiarity with buying secondhand products might have increased interest in buying refurbished smartphones. The interviews with secondhand shop retailers show that Indonesian consumers prefer products from selected brands. For consumers in Indonesia, where the consumer protection regulations for secondhand transactions are still limited, the brands embedded in an OEM's products may act as an indicator of quality (Aaker, 1991) and a warranty (Hamzaoui-Essoussi and Linton, 2014). Thus, a refurbishment business based on an OEM model could be a safe choice for Indonesian refurbishers and increasing consumer protection should be necessary to promote trust in third-party refurbished smartphones in Indonesia.

6. Conclusions

There is no question that refurbishment is a promising solution to our society's transition to a CE when properly harmonized with our choices and consumption behaviors. Even though an established market for some refurbished products is already available (Mugge et al., 2017b), given that refurbishment is not a very popular option for consumers shows that there are still barriers. Previous studies stressed that practitioners should pay more attention to consumers' behavior and attitude to predict their adoption or purchasing of refurbished products. Better insights into consumer acceptance can be obtained if more studies on refurbished products are explored in different cultural contexts (Singhal et al., 2019; Van Weelden et al., 2016). This study addresses this gap and contributes to the Asian refurbishment marketing literature by offering a deeper understanding of the underlying factors (PR, PC, and IN) influencing Asian (Japanese and Indonesian) consumers' behavioral intention to purchase refurbished smartphones. Our study also provides market and legislation reviews for Japan and Indonesia that allow us to identify the two countries' salient features and understand the difference in consumers' PI of different smartphone categories under these local-specific backgrounds. The recent studies have focused either on refurbished smartphones manufactured by a third-party refurbisher or on those sold by the brand owner. The present study explores consumer perspectives for both refurbished smartphones, which can be valuable for various stakeholders.

Our findings showed that the PR of refurbished products and consumer IN can affect consumers' behavioral intention to purchase refurbished smartphones regardless of the supplier (either an OEM or a third-party manufacturer) in Japan and Indonesia. Further, findings suggested that a pricing strategy would stimulate local demand for refurbished smartphones, particularly in Indonesia and Japan, albeit to a limited extent.

More specifically, in Japan, the difference in PI between an OEM's and a third party's refurbished smartphone is much smaller than in Indonesia. Moreover, the recent easing of regulations has made the market more accessible to independent refurbishing companies and has encouraged telecommunications companies to consider the circular market more closely. Practitioners should recognize this as a business opportunity. In Indonesia, the demand for a refurbished smartphone provided by an OEM is relatively higher than in Japan. Secondhand shopping is not a rare scene in their daily lives. Shifting their preferences from secondhand shopping into circular consumption is promising.

Despite the contribution of the findings presented here to the refurbishment literature, this study has several limitations. Firstly, many factors we have not considered here can explain consumers' buying intention for refurbished smartphones. Including other factors, such as hygienic, product-oriented, or management-related factors, could help us complete the puzzle of consumers' behavioral intentions related to circular consumption. While our findings revealed that PR, PC, and IN could influence two Asian consumers' intention to accept refurbished smartphones, we should avoid stereotyping consumer behaviors. Considering that Asia is a vast region characterized by cultural diversity, more local studies would be applauded. Another limitation is the stated preference approach. This study set hypothetical conditions; thus, survey participants may express a more positive attitude and intention towards these conditions, but an attitude/intention-behavior gap still exists. Further study should focus on an actual market setting towards refurbished or secondhand products in the Asian market.

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.

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Appendix A. Supplementary data

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