


Article

Circular Economy as a Glocal Business Activity: Mobile Phone Repair in the Netherlands, Poland and China

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Abstract: Repair of mobile phones fits with the vision of a circular economy in an urban context and with the Sustainable Development Goal 11 Sustainable Cities and Communities. Drawing on the literature about firm level competitiveness and closed-loop design through repair, remanufacturing or recycling, we analyze the business ecosystem of independent mobile phone repair shops in the Netherlands, Poland and China as a glocal business activity. The analysis is based on primary data collection through a questionnaire to independent repair shops in the Netherlands ($n = 130$), Poland ($n = 443$) and China ($n = 175$) with response rates of 13%, 12%, 40%, respectively; and 17 interviews in the Netherlands, 40 in Poland, and 70 in China. Findings indicate that to maintain a strong position in the local market and to sustain the trust of customers, independent mobile phone repair shops offer a range of customized services based on direct contact with customers. In China, the increasing prices of spare parts and falling prices of mobile phones constitute the most important challenges, whereas in the Netherlands and Poland, the most important challenges are the competitive pressures from informal repair activities, and new repair shops. Our research also revealed that repairability strongly depends on the global manufacturers' circularity choices.

Keywords: circular economy; business ecosystem; glocality; mobile phone repair; the Netherlands; China; Poland

1. Introduction

Repair of mobile phones fits with the vision of a circular economy in an urban context. Repair as a local loop and an inner cycle of a circular economy is significantly distinguished from relatively larger and also potentially regional and global loops, the outer cycles of remanufacturing and recycling activities of a circular economy. Local repair businesses in an urban context extend the lifetime of mobile phones and reduce the need for virgin materials, which in theory results in environmental benefits [1–5]. In addition, local repair businesses contribute to lower levels of waste electrical and electronic equipment (WEEE) in cities and increase maximum possible usage of mobile phones over time, along with supporting refurbishment, remanufacturing, and recycling activities. Globally, repair activities and repair shops can also be viewed as local contributors to the global development agenda, namely, the Sustainable Development Goals (SDGs), which were agreed upon by the 193 members states of the United Nations (e.g., SDG 11 Sustainable Cities and Communities), and especially the

target of “reducing the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management by 2030” [6,7].

Repair activities constitute a business response to an economic opportunity, which complements civil society responses of product repair, and repair and resale activities of social enterprises (e.g., organized in Europe via RREUSE (RREUSE represents social enterprises active in re-use, repair and recycling in Europe)). Locally, mobile phone repair activities also offer employment to those working (migrant workers in the Netherlands, who dominate the business).

Concentrating on the historical and contemporary mobile phone technology, and its global-scale market, a hundred years ago Finnish inventor Eric Tigerstedt filed a patent for a pocket-size folding telephone with a very thin carbon microphone in 1917; in 2017 we observe that the number of mobile phone users is forecasted to reach 4.77 billion people around the world [8]. In 2017, as many as 1.54 billion mobile phones were sold worldwide [9]. In the Netherlands, mobile phone penetration rate reached 68.8% with 11.7 million (mln) users; in Poland, 66.5% with 25.6 mln users; while in China, its 51.7% penetration rate corresponds to 717.3 mln users [10]. New generation mobile phones, especially smartphones with internet-enabled, feature-rich applications, are relatively expensive devices with a mid-range retail price between EUR 150 and 450 [11]. Typically, these technological devices still come with relatively fragile screens (although improvements against fragility by manufactures are being introduced) or otherwise hard-to-replace components when/if they malfunction and/or require cosmetic corrections [12]. These financial and technological constraints encourage consumers more frequently to turn to repair shops to rescue their devices which are still operable, and to pursue less expensive alternatives compared to replacement and upgrading options. Initially, mobile phone users turned to official brand shops and to non-official shops for repair (people working from home) but, over time, independent repair shops were created, to which people could bring their phone for repair and special services, with the repairs being done quickly and at a far lower cost than when the repair is done by the suppliers working for official brands. Helped by low entry barriers, these independent repair shops developed strategies that offered competitive, and also superior, customer value.

Independent repair shops are growing in number worldwide, and the objective of this article is to investigate the business of mobile repair shops from a global business ecosystem perspective based on the diamond model of Porter in three different local contexts, namely, the Netherlands, Poland and China. The overarching research question of this article is: to what extent do mobile phone repair activities and circularity relations of independent repair shops differ in the Netherlands, Poland and China, and under which conditions do they try to competitively operate in their business ecosystems? With this article, we aim to fill this gap in the literature, by offering an analysis of ‘the diamond’ of firm strategy and offerings, factor conditions, demand conditions, and the links with upstream and downstream industries (especially parts producers) and circularity relations with recycling companies and remanufacturers.

The article proceeds as follows: in Section 2 we position our article in terms of related literature and provide its conceptual background: Porter’s diamond model depicting the dynamic conditions affecting competitiveness of firms, the framework for a closed-loop design for repair, remanufacturing and recycling in the context of a circular economy, and the hierarchy of secondary market production processes with respect to labor content, performance, and warranty criteria. In Section 3, we provide details about the designed and implemented survey, interviews and the rationale for opting for using those methods. Section 4 presents the findings from Dutch, Chinese and Polish contexts. In Section 5, we further discuss our findings in the context of a circular economy and provide conclusions on future research and policy directions.

2. Literature Review and Conceptual Background

The behavior of consumers in turning to mobile phone repair shops or remanufactured mobile phones has been studied in detail by scholars [13–17], yet the emergence and heterogeneous evolution of mobile phone repair shops and the sector in transition as a whole (including demand side and

circularity dynamics) from independent mobile phone repair shops' perspective is less studied, and accordingly less well known [17–20]. Comparative studies are even rarer.

The mobile phone repair industry and market are growing: Watson et al. report that “the repair industry is exploding in Nordic countries with phone repair shops appearing on the high streets of every market town” [19]. The situation is likewise observable in the Netherlands, Poland and China. Repair rates are higher in East Asia—66% in China and 64% in South Korea—than in Germany (23%) and in the US (28%) [21,22]. In the Netherlands, 12% of the currently used phones are either used (second-hand/directly sold) or refurbished, and the most common used/refurbished phones are Apple IOS phones (19%), followed by LG (12%), Sony and Samsung (each 9%) and Huawei (4%) [23]. In China, according to Kantar Worldpanel 2017 data for the mobile phone market, Android phones accounted for 71.2% of market share, while Apple IOS phones accounted for 28.6%. Meanwhile, Huawei, Xiaomi, Apple, Vivo and Oppo, the top five mobile phone manufacturers in China, occupied 91% of the total market share. The proportion of China's second-hand and refurbished mobile phones is similar to that of the Netherlands, and refurbished iPhones have the largest profit and dominate the share of the total number of refurbished phones. In Poland, mobile phones from global manufacturers based in East Asia also dominate the market, e.g., Samsung (30.39%), Huawei (29.14%), LG (12.71%), Xiaomi (5.07%), Lenovo (3.22%), and Sony Ericsson (3.06%) [24].

While mobile phone repair constitutes a business response to an economic opportunity in Europe, complementing the civil society responses of product repair and repair and resale activities of social enterprises (organized in Europe via RREUSE), in China, the story of mobile phone repair is slightly different. In the early stage of the mobile phone industry, after-sales services for mobile phones were implemented by various manufacturers, where mobile phones were collected by the authorized service stations and sent to the central maintenance service station for repair. To deal with the problems of slowness, mobile phone manufacturers launched a rapid maintenance service and set up a rapid response maintenance team in the first level market, to provide after-sales service for users more quickly. With increasing competition in the mobile phone industry, and the emergence of more and more domestic mobile phone manufacturers in particular, the profit level of the entire mobile phone industry is decreasing. Because the quality of mobile phone after-sales services had a great impact on the reputation of the mobile phone brands, and because the construction of a wide range of after-sales service networks required not only substantial funds but also excellent chain management abilities, mobile phone manufacturers gradually outsourced the after-sales service of their phones. For this reason, more and more third-party independent maintenance organizations appeared in China [13,25].

In this sense, to analyze the competitive dynamics, we use Porter's 'diamond' model as the principal framework [26,27]. By incorporating firms' strategy, structure and rivalry into a wider framework made up of demand conditions, factor conditions, government policy, and related and supporting industries, the 'diamond' model is an appropriate model for the analysis of mobile phone repair activities in the context of a circular economy (Figure 1). Each of the five elements is thus viewed as being relevant for the purpose of our article and analysis. Criticisms of Porter's model that it does not give sufficient attention to global interactions and the role of multi-national corporations [28–30] do not pertain to our analysis, which explicitly looks at international supply chains and the decisions of multinational mobile phone producers regarding product design, spare parts production, and repair and remanufacturing. Our analysis is not used to investigate the propositions of Porter's framework (e.g., that rivalry is critically important in pressuring companies to innovate, to cut costs, and to improve quality). The framework is used as an analytical framework, adapted to the analysis of glocal business activities of independent mobile phone repair shops.

Competition/rivalry is a key phenomenon in the mobile phone repair industry. Independent repair shops compete in local markets with one another and with original equipment manufacturer (OEM) repair shops. Although official (authorized/certified) repair stores exist, they are challenged to do a very good job in servicing customers who have to pay relatively higher prices, cannot speak directly to the person doing the repair, have to send the phone by mail and have to wait for a

considerable time for the phone to be repaired and returned. The relatively poor customer value can be related to the main interest of global mobile phone manufacturers lying in the business of producing and selling new phones, yet being helped by low entry barriers and traditions of informal repair. Independent mobile phone repair shops emerge, enter the market of repair and earn a living repairing mobile phones by providing relatively superior value propositions that fill financial, technical, and even social gaps for local customers.

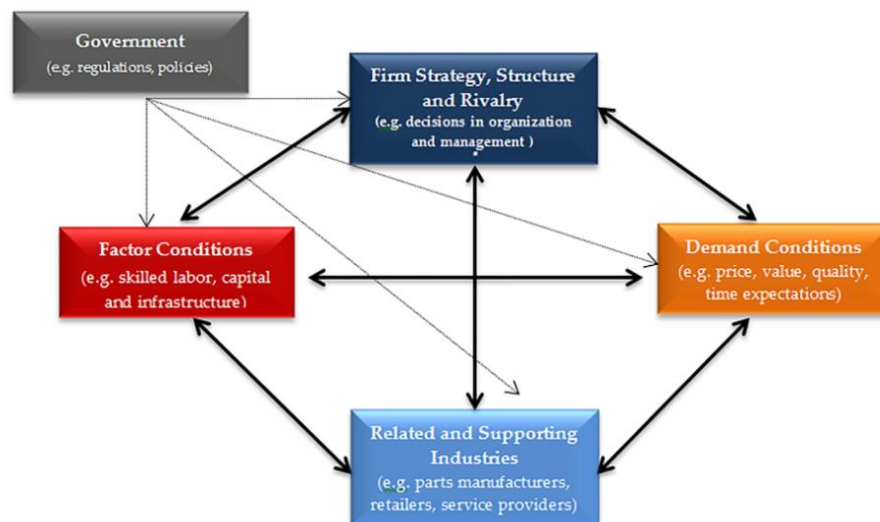


Figure 1. Porter's diamond model. Source: Authors' work.

Government policies also play a role in this. The two-year warranty requirement (Directive 1999/44/EC), extended producer responsibility and waste electrical and electronic equipment (WEEE) legislation in Europe necessitated remanufacturing, reconditioning and/or repair at the manufacturers' side. With such legislation, manufacturers became liable for their products through and beyond their end-of-use life. The activities of repair compete with the options of remanufacturing and recycling. This means that there is not only rivalry between repair companies but also competition between four alternative strategies to reduce end-of-life waste within the context of extended producer responsibility, namely, repairing, reconditioning, remanufacturing and recycling (Figure 2). Original mobile phone manufacturers thus align towards establishing their own official repair services, globally.

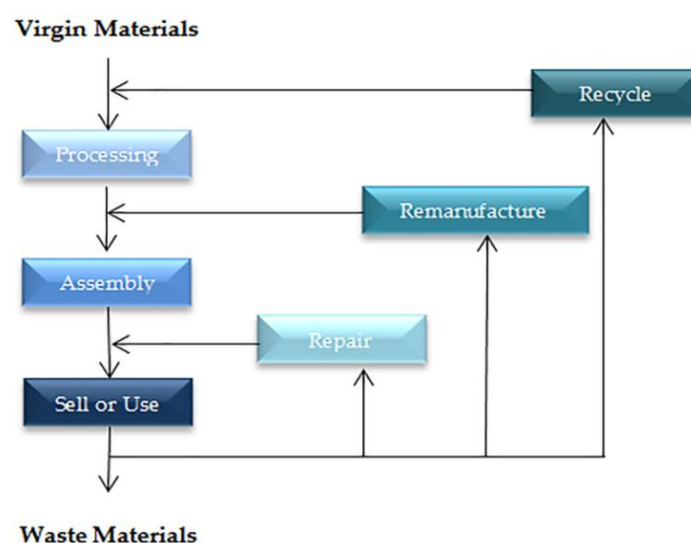


Figure 2. Closed loop design through repair, remanufacturing or recycling. Source: Author's work.

The environmental aspects of mobile phone repair versus remanufacturing, recycling and disposal have been studied by [6,31–36]. The conclusions broadly confirm the statement made by Stahel that the recycling loop (in Figure 2) which uses highly disordered materials, also requires more corrective energy than the remanufacturing loop where the primary shape of the product is preserved [37]. Remanufacturing, on the other hand, in general requires more material, energy and labor skill content (Figure 3) than reconditioning and repair activities [38]. Economic conditions tend to favor the recycling of materials over repair and reuse [37–39], both of which extend the lifetime of products and contribute to the local economy [18]. Nevertheless, this holds less true for mobile phones because of the high prices of new phones from the perspective of mobile phone users.

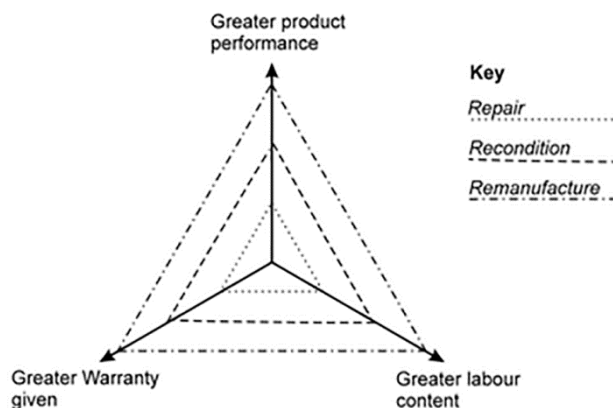
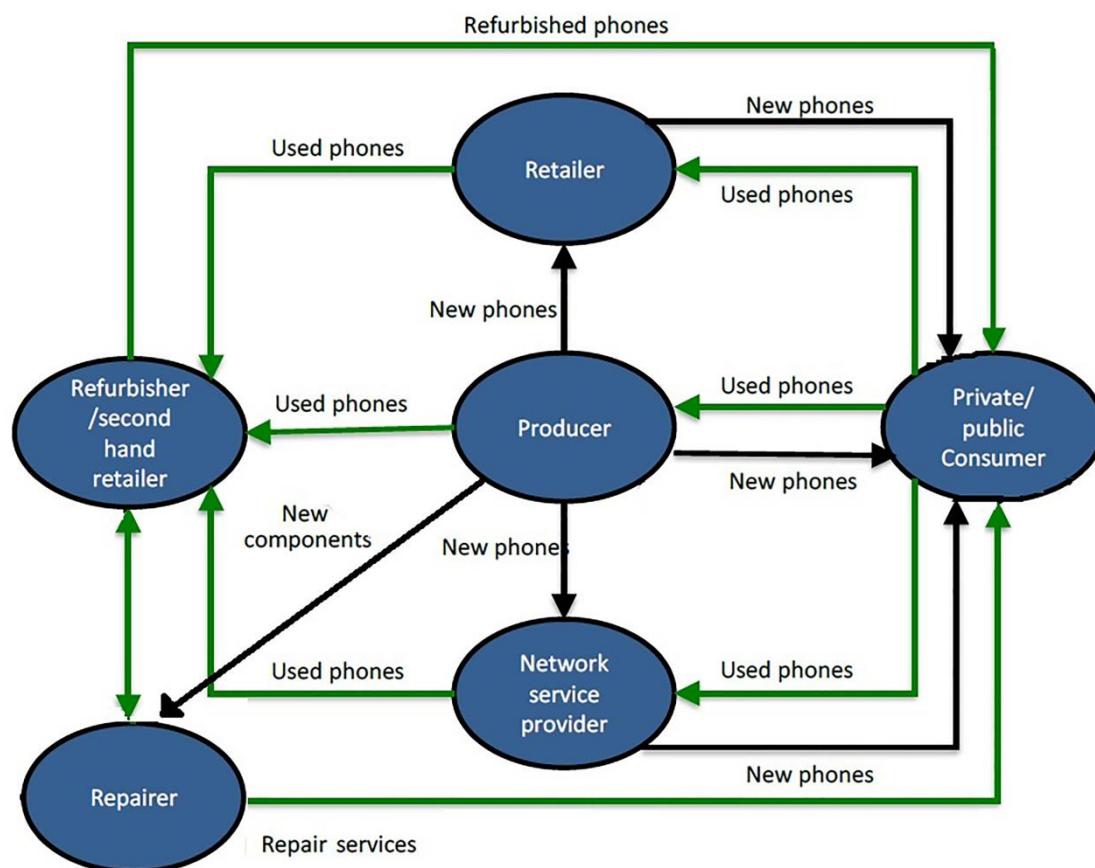


Figure 3. The hierarchy of secondary market production processes. Source: [39,40].

Factor conditions denote specialized factors of production or service, such as conditions related to skilled labor, capital and infrastructure, which give a firm its competitive edge. Independent repair shops benefit from low levels of entry barriers in the form of relevant skills needed in repair activities and financial capital to establish a small or medium size repair shop, and do not rely on sophisticated infrastructure to be able to provide their repair services. Yet, for each of these aspects related to factor conditions, real challenges exist in sustaining the business, due to the advances in mobile phone technologies. Mobile phones by design have become more difficult to repair, and require acquisition of new knowledge and capabilities by repair shops to be able to continue repairing these new devices. In addition to technical skills, social skills and capabilities are becoming more relevant to connect with different generations of mainly local customers. Although initial capital needs to establish a repair shop are relatively low, maintenance of the business necessitates selling additional products and services to create additional streams of revenue ranging from selling accessories and mobile phone call credits, to selling used or new laptops and portable sound systems. Finally, the tools needed to continue repairing new devices, and finding trusted electronics or accessory retailers for parts and additional products, as well as their price dynamics, challenge the repair shops. Shops which can manage to overcome these challenges, through their specialized factor conditions, are more likely to survive and register profits.

For independent repair shops, the presence of related and supporting industries is of critical importance. Six groups of industrial actors make up the mobile phone industry: mobile phone producers, electronics retailers, network service providers, repair services, refurbished second-hand sellers, and accessory producers and retailers (Figure 4).

Electronics producers and retailers, which provide spare parts and components to be used in repair services, form the main supporting industry for repair shops. Activities of refurbished second-hand sellers, such as repair and data removal prior to sales, make used/refurbished phones more common phenomena in the market for customers. Many repair shops also engage in these second-hand repair and sale activities as a side business (Figure 4).



Actors	Linear Activity	Circular Activity
Mobile Phone Producers	-Producing phones (model upgrades and obsolescence)	+Designing phones for durability and ease of repair
	-Producing spare parts	+Provision of spare parts for repair
	-Providing services limited to warranty schemes	+Take-back services
Electronics Retailers	-Providing mobile phones to consumers	+Nudging customers towards greener alternatives
	-Providing mobile phones to businesses	+Entering the second-hand market by selling used mobile phones to refurbishers or repair shops
	-Providing services limited to warranty schemes	+Acting as a collection point for waste electrical and electronic equipment (WEEE)
Network Service Providers	-Selling mobile phones by subscriptions of network services	+Leasing mobile phones and mobile phone upgrades
	-Providing mobile phone upgrades phones by subscriptions of network services	+Buy-back mobile phones and mobile phone upgrades
Mobile Phone Repairers	By definition circular (maintaining, prolonging the life of product)	+Repair by using new parts, +Repair by using used parts, +Trading second-hand mobile phones with warranties to customers and businesses, +Entering the second-hand market by selling used mobile phones to new users or refurbishers and/or remanufacturers, +Acting as a collection point for WEEE, +Selling or sending mobile phones to recyclers.

Figure 4. Stylized relations among actors in mobile phone industry value chain. Source: [19].

Thanks to their local presence (which allows for direct contacts with clients), skills, ties with global upstream and downstream suppliers, relatively superior price for repair propositions, and the selling of additional accessories and services to customers, independent repair shops are able to create competitive customer value.

3. Data and Method

For this article, we engaged in primary data collection via a questionnaire with closed and open survey questions, and interviews. This questionnaire served the purpose of obtaining factual and qualitative information on a large number of issues with regard to firm strategy, structure and rivalry, factor conditions, demand conditions, relating and supporting industries, the role of governmental interventions, and the dynamics of these repair shops within a circular economy transition context in their global business ecosystem. Interviews with participants helped us to more deeply explore specific issues, and a meeting with three repair shops owners in Maastricht helped us to sharpen the question-and-answer categories (and to remove sensitive questions on profits and other issues). Survey questions in English can be found in the Appendix A (questions for the Netherlands, Poland and China were basically the same, but adapted to the local context and language). Table 1 maps sub-sections of our survey to the theoretical background presented in Section 2.

Table 1. Survey development.

Survey Sub-Sections	Corresponding theoretical components and interactions
Establishing the Business	Firm strategy, structure and rivalry
Human Capital Needs	Factor conditions
Part Inventory	Firm strategy, structure and rivalry
Tool and Equipment Inventory	Firm strategy, structure and rivalry
Doing the Business	Firm strategy, structure and rivalry; Related and Supporting Industries
Other Supply Chain Issues	Related and Supporting Industries
Technical Capabilities, Infrastructure and Innovation	Firm strategy, structure and rivalry
Customer Relations	Demand conditions
Threats	Government; Firm strategy, structure and rivalry; Factor conditions; Demand conditions; Related and Supporting Industries
Views on Mobile Phone Manufacturers	Firm strategy, structure and rivalry

The questionnaire was prepared in English, translated into Dutch, Chinese and Polish, and pilot-tested in each country before contextual adaptations are performed. For the case of the Netherlands, it was sent online to 130 independent mobile phone repair shops after desk research to identify these shops; 17 out of 130 participated in our study (13% response rate). In China, we undertook an on-site inquiry to investigate the data and a total of 76 mobile phone repair shops answered the interview questions. After collation, we received 70 valid questionnaires, which accounted for 40% of the shops contacted. In Poland, both online distribution of the questionnaire and computer-assisted telephone interviews (CATI) were used to reach respondents, resulting in 52 answers from 443 attempts to contact repair shops (an average response rate of 12%).

Our questionnaire with closed and open questions and complementary interviews were the primary methodological instruments used for analyzing the dynamics of the global business ecosystem of independent mobile phone repair shops. The response rate for the Netherlands (13%) was rather low because of the difficulties associated with the target population, which was reluctant to participate due to busy work schedules, crowded repair shops during work hours, take-home tasks from work

and tiredness after work hours. Since we conducted complementary interviews, on the issue of size, we relied on Guest, Bunce and Johnson, who found that 6 to 12 observations (interviews) are sufficient for a scientific inquiry into a homogenous sample [41]. Our observations are mainly from Limburg and North Brabant provinces of the Netherlands, and apply foremost to these provinces. In China, the research group was divided into four teams, and the survey was conducted in Shanghai, Anhui, Jiangsu and Hubei. Most of the surveys were carried out by students during their summer vacation. A total of 175 mobile phone repair shops were visited, and about 40% (70 repair shops) agreed to accept our interview. Among the feedback survey, there were 18 repair shops in Shanghai (45.7%), 11 in Hefei Province (15.7%), 11 in Jiangsu Province (15.7%), and 16 in Hubei Province (22.8%). In Poland, the questionnaire was first distributed online, sent to 280 mobile phone repair shops, resulting in 12 responses (4% response rate). As the low response rate is a well-known problem in online distributed questionnaire research, to increase the number of responses, on the second stage of the research process, structured interviews were conducted using CATI via a contracted market research company in the Warsaw metropolitan area. After effectively contacting 262 companies sampled as mobile phone repair shops based on the official enterprise register, an additional 40 interviews were conducted (response rate 15%). The results from both stages were analyzed jointly, resulting in 52 observations.

With regard to the response rates above, the probability of capturing a theme within a sample can be approximated by the ratio of the sample size to the target population [42]. A sample of 13% of the target population size indicates a probability value between 0.81 and 0.92 that all themes relevant to our study are captured. In this regard, we judge that our samples for the Netherlands, Poland and China, especially at the provincial levels named above, are representative. In other words, the small size can be expected to not significantly influence our findings and conclusions. While it would have been better to have a larger sample size, the study does not claim strong generalizability, but rather relevant contextual insights that are believed to apply more widely (according to our informers). However, further research is needed for determining the robustness of this argument.

4. Results

Table 2 below demonstrates the findings for selected questions in a comparative way among the Netherlands, Poland and China. In Section 4.1 (The Netherlands), 4.2 (China) and 4.3 (Poland), we analyze the overall results and discuss findings.

Table 2. Selected results from mobile phone repair shops survey.

Survey Questions		NL (<i>n</i> = 17)	PL (<i>n</i> = 52)	CH (<i>n</i> = 70)
Establishing the Business				
Q3	3. Are you involved in the business of selling refurbished mobile phones? (yes/no)	47.10% (yes)	23.10% (yes)	15.71% (yes)
Q5	5. How long did it take you to establish your mobile repair shop (from idea to becoming operational)? in months:	2 to 4 years	In a few months	At least 6 months
Q6	6. Before starting an official business, did you repair mobile phones on an informal basis? (yes/no)	29.40% (yes)	15.40% (yes)	65.70% (yes)
Q7	7. What business or other activity (education, unemployed etc.) were you involved in before you established a repair company?	Educational background in IT or IT-related fields. Previous areas of business vary, yet all related to services sector, such as construction services, cooling and air-conditioning services, logistics, car repair, insurance sales, outlet sales, sports and gym management	Very diverse professional experience, such as production work, customer care, advertisement, or watchmaker. Also, education varies from general secondary school to higher education in IT or chemistry	Most of the respondents worked in IT related occupations. A few of the respondents were engaged in other business, such as salesmen and attendants.

Table 2. Cont.

Survey Questions		NL (n = 17)	PL (n = 52)	CH (n = 70)
Establishing the Business				
Q11	11. Did competition increased in the last year?	76.50% (yes)	50% (yes)	68.57% (yes)
Part Inventory				
Q17	4. What percentage of the parts is new? ... % of the parts are new	95%	34.60%	68.60%
Doing the Business				
Q26	2. Do you give a warranty? (yes/no)	100%	100%	74.29%
Other Supply Chain Issues				
Q31	1. Do you accept phones by postal mail? yes/no	94.10% (yes)	82.70% (yes)	51.43% (yes)
Q32	2. Do you have contact with remanufacturers? yes/no	23.50% (yes)	26.90% (yes)	24.29% (yes)
Q33	3. Do remanufacturers collect phones from your store? yes/no	0% (yes)	15.36% (yes)	42.86%(yes)
Q34	4. Do you have contact with recyclers? yes/no	64.70% (yes)	34.60%(yes)	58.57%(yes)
Q36	6. Do you receive payments for giving phones from recyclers? yes/no	11.70%(yes)	7.68%(yes)	61.43%(yes)
Q37	7. Do you receive or collect phones beyond repair? yes/no	41.20%(yes)	67.30%(yes)	50%(yes)
Customers				
Q39	1. Do you buy phones from your customers for repair and resale? (yes/no)	64.70%(yes)	42.30%(yes)	24.29%(yes)
Threats				
Q42	1. What are the main threats for your repair business?			
	Informal repair shops	68.80%	44.20%	37.50%
	Rising prices of parts	37.50%	32.70%	62.86%
	Falling prices of mobile phones	43.80%	38.50%	61.43%
	Replacement plans	12.50%	0.00%	15.71%
	New repair shops	62.50%	38.50%	42.86%
	Provisions on employment Conditions	6.30%	13.50%	5.36%
	Provisions on maintenance product safety	0.00%	7.70%	12.86%
	Leasing	12.50%	11.50%	8.57%
	Provisions on operation and maintenance business	43.80%	15.40%	20.00%
	Rising maintenance tools and equipment prices	6.30%	13.50%	38.57%
	Official shops	43.80%	19.20%	50.00%
Q43	2. Have phones become difficult to repair? (yes/no)	58.80% (yes)	69.20% (yes)	71.42% (yes)
Your Views				
Q44	1. Could manufacturers do more to avoid the need for repair?	35% (yes)	51.9% (yes)	50% (yes)

4.1. The Netherlands

4.1.1. Informality and Transitioning to Official Repair Business

In the Netherlands, 29.4% of respondents indicated that they repaired phones in an informal way before they started their business. In line with this, provisions on the operation and maintenance of business are reported as an important business threat by 43.8%. Before getting into mobile phone repair activity, half of the interviewees report an educational background in IT or an IT-related field. Previous areas of business vary, yet all related to the service sector, such as construction services, cooling and air-conditioning services, logistics, car repair, insurance sales, outlet sales, and sports and gym management. Interestingly, many migrants are active in the mobile phone repair sector both as owners and workers. One reason for this is that migrant owners prefer to recruit migrant workers. Informal activities usually take 2 to 4 years in transitioning to an official shop.

4.1.2. Motivation Behind Establishing a Repair Shop and Profitability

In the Netherlands, business experience of former shop owners is deemed not so important. We observe that high profits and low risk still play an important role, if not a crucial one, in the Dutch context, and, in general, 6 months is the average duration to reach profitability. This is highly likely to be due to the mobile phone penetration rate and the higher average price of the devices owned in the Netherlands.

4.1.3. Threats in the Business Ecosystem

In the Netherlands, informal repair shops and new repair shops are the biggest threats (68.8% and 62.5% respectively). Increasing prices of spare parts and falling prices of mobile phones also affects the Dutch context. However, rising prices of maintenance tools and equipment and provisions on employment conditions do not threaten the repair shops (6.3%). Official repair shops and provisions on the operation and maintenance of the business pose considerable business threats according to the respondents (each 43.8%) (Figure 5).

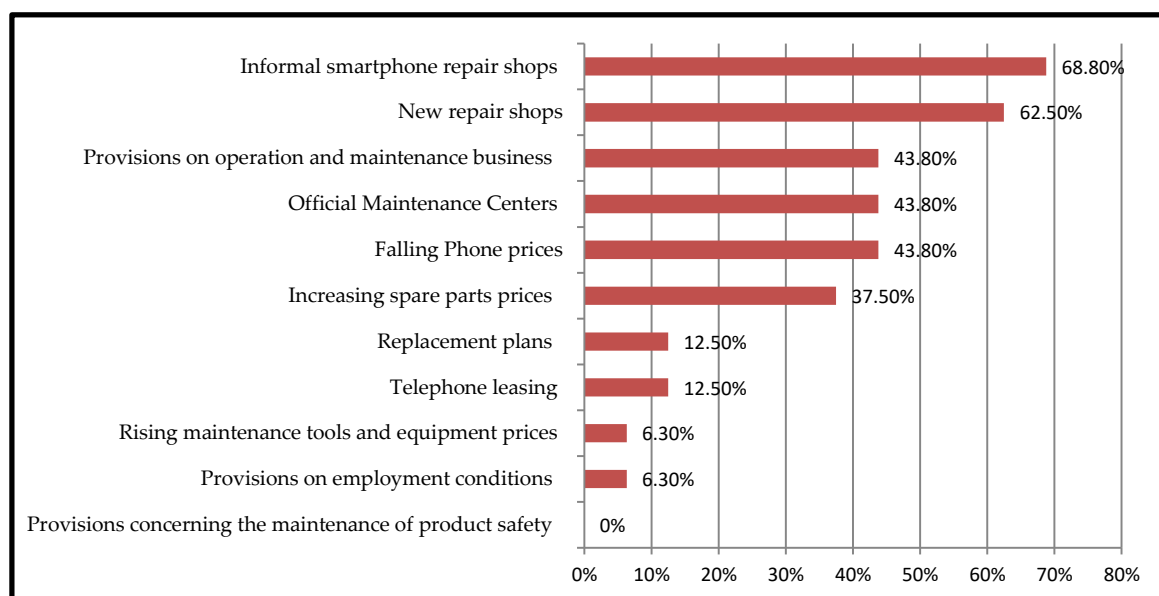


Figure 5. Business threats to mobile phone repair shops in the Netherlands.

Interviewees in the Netherlands mentioned defensive actions of mobile phone manufacturers as a business threat. One interviewee indicated that “Certain brands do not make available parts for non-official repairers, which makes it difficult to guarantee quality”. Mobile phone manufacturers

usually work with their own official repair services, and they also engage into certification of other shops to authorize them. For non-authorized shops, these authorized/certified repair shops are a business threat. One interviewee indicated that once repair shops get authorization certificates, they deprecate unauthorized/non-certified repair stores: “We are often blackened by certain companies that say we are very bad, and these companies have a certificate”. However, the defaming of non-certified repair shops is not completely without grounds. An interviewee admits that “Some independent repair shops create a very bad image for the entire independent repair shops by using very low quality and cheap spare parts” and this results in misinformation and, thus, an unfair competitive environment. Competition is skewed to companies with advertising power. An interviewee points out that “Official stores use online advertisement AdWords; they pay to pop up first in Google Search”. The business environment for mobile phone repair business becomes more challenging as a greater number of informal and illegal repair activities enter in the market: “There are more and more homeworkers . . . illegal businesses”. Yet not all threats are external; repair shops are challenged also by internal weaknesses in keeping up with the new knowledge: “Repairing becomes more difficult and the knowledge is not always there . . . maybe also because of my age”. In the Netherlands, 58.8% of respondents pointed out that mobile phones have become more difficult to repair.

Considering business threats, as expected, in the last year (2017) competition increased for 76.5% of respondents in the Netherlands: “Unfortunately, there are too many shops that offer repair for a very low price”.

4.1.4. Supplier Relations

In the Dutch context, 59% of the repair shops change their suppliers quickly for cost reasons (47.1% do not). Formal and informal contracts are equally used. The origin of main suppliers is China. Direct supply accounts for 76.5% of mobile phone repair shops in the Netherlands. As well as the low price, the variety and reliability of supply are also important determinants for the choice of suppliers. Most use China as a preferred supplier. Some rely on intermediaries: “It was easier at the beginning but now the quality parts are hard to find if you have to buy them yourself. The big buyers in the Netherlands know their way and therefore also find good parts at a reasonably attractive price.” Interviewees also indicated that components are often not available in Europe, and that even the original parts are available in China. “Big buyers are mainly located in the Netherlands, if we cannot find what we are looking for from them, we contact big buyers in Germany or in the UK”.

4.1.5. Customer Relations

Social interactions with customers play an important role in establishing a mobile repair shop in the Netherlands (76%), and keeping up with these social relations is deemed as a key activity. Interestingly, 66.7% of the shops have decided not to use such parts to maintain the trust between them and their customers, and to provide best customer satisfaction. Very much in line with this, 58.8% offer paid and unpaid services outside the repair of components in the Netherlands. The most common service provided to customers is related to software (e.g., software recovery, support, reset and replace), followed by data related services (e.g., data backup, transfer, recovery, memory reset). Financially, these services form an important part of the revenues of only 31.3% of firms. Reductions, discounts, or even no billing in some cases for such services are used to maintain good social interactions with customers, sustain customer satisfaction and enhance customer loyalty. Repair shops also extend their services to logistics companies as contact points, e.g., for DHL and Western Union. In line with this, 94.1% of respondents accept phones by postal mail.

4.1.6. Circularity Oriented Economic Relations

Only 23.5% of the surveyed repair companies indicated having contacts with remanufacturers. Remanufactures do not collect phones from independent repair shops. A total of 64.7% of the repair shops is in contact with recyclers, but only 17.6% send or sell to recyclers, where only 11.7% of the

repair shops are being paid by these recyclers for these sent phones. In addition, 41.2% also collect mobile phones beyond repair, 47.1% sell refurbished phones, especially after 2015, and 52.9% are interested in using parts from used phones more often. A total of 64.7% of respondents buy used phones to sell later.

Contact with recyclers, as well as selling refurbished phones, are established practices. According to Deloitte (2017), 12% of mobile phones in the Netherlands are either reused or refurbished. An interviewee indicated that “Refurbished market is rising enormously. Many customers ask for used or refurbished devices. Due to the compulsory Bureau Krediet Registratie (BKR) registration for phones over 250 Euros bought with credit, many people buy a separate device instead of taking a subscription with registration”. Environmental reasons, customer demand, and cost reasons are the most important motivations behind using components from used phones; supply constraints for new parts is the least important factor in Dutch context. On this, interviewees indicate that “Used original parts do not mean that they are worse. Some copy parts that are new are less good as a used original. So used parts are not bad from experience and it is also much better for the environment”.

Using used parts necessitates testing and careful disassembly: “As long as every part is tested, that’s well, nothing is wrong. But then you have to start looking again that these parts do not become more expensive than the new parts”. Another interviewee notes that parts from used devices are not tested properly. “Often these parts come from water damaged devices. It is a nice idea to get parts from used equipment, but it requires paying attention to disassembly which is not common if you buy used spare parts from somewhere else”.

New parts are used by 95% of respondents. Paying for a used phone is different than paying for a used part to be utilised in repair. Customers do not prefer repairs with used parts and prefer new parts. Repair shops provide a 100% warranty in the Dutch context, which is in line with the finding that provisions concerning the maintenance of product safety are reported as a zero threat. All respondents request a supplier guarantee in the Netherlands.

4.1.7. Planned Obsolescence and the Future of the Repair Business in the Netherlands

Many interviews said that mobile phones are designed to have a short life. According to one independent repair shop owner “Manufacturers’ initial aim is the sale of a new device every two years, making the device weaker so that the device does not last longer than 2 years. Yet they also earn on the parts”. Another interviewee reflects on the technological advances at the side of manufacturers and consumer attitudes towards newness: “We are a disposable industry and that is not only because of less quality but also because of design, innovation, new and better techniques, developments (e.g., stronger glass (possibility is already available with sapphire glass)) . . . but certainly, also because of the urge of people to own something new and be able to afford it”. Planned obsolescence is a complex phenomenon involving hardware-based weaknesses, software-based update requirements, as well as new design features which make an older yet fully functioning model undesired in the eye of the customers. Although measures are taken for hardware-based weaknesses (e.g., waterproof devices, stronger glass in screens), software-based obsolescence still remains as an important part of the planned obsolescence debate. Yet, in the Netherlands, an increase in the demand for mobile phone repair is also foreseen by repair shop owners due to increasing awareness (e.g., technical, economic, legal) of the demand side: “It is becoming increasingly known to people that a device can still be repaired. It is also becoming increasingly known that there is a difference in the quality of repairs/parts”, and due to government interventions, changes in law relating to subscriptions, and “especially, due to changes in the law and change of subscription structure”.

4.2. China

4.2.1. Informality and Transitioning to Official Repair Business

In China ($n = 70$), 65.7% of respondents reported that they repaired mobile phones on an informal basis before they officially started business. Before getting into mobile phone repair activity, most of the respondents worked in IT-related occupations. A few of the respondents were engaged in other businesses, such as salesmen and attendants. Compared with the Netherlands, mobile phone repair shops in China usually do not involve immigrant owners. It usually took at least half a year for informal activities to transition into an official shop in China.

4.2.2. Motivation Behind Establishing a Repair Shop and Profitability

Prospects of high profits (47.1%), low risk (41.4%) and previous experience (42.9%) are considered very important drivers in establishing their shops. Within one year after opening, 50% report that they reach profitability. The large number of mobile phone users and the fast updating of smart mobile phones in China are positive contributing factors.

4.2.3. Threats in the Business Ecosystem

The main threat in the business ecosystem is financial: rising prices of parts (62.86%) and falling prices of mobile phones (61.43%). Next to this, official repair centers (50%) and new repair shops (42.86%) are said to pose a serious threat for the independent repair shops. Rising prices of maintenance tools and equipment (38.57%) are a bigger threat than informal repair shops (37.5%) in China. Provisions for operating and maintenance business (20%), replacement plans (15.71%), provisions on maintenance product safety (12.86%) are less pressing, while phone leasing (8.57%) and provisions on employment conditions (5.36%) form the least significant threats according to the respondents. Non-repair activities are engaged in by 61.43% of respondents for additional revenue. In the context of China, competition in the mobile phone repair market has increased for 68.57% of respondents (Figure 6).

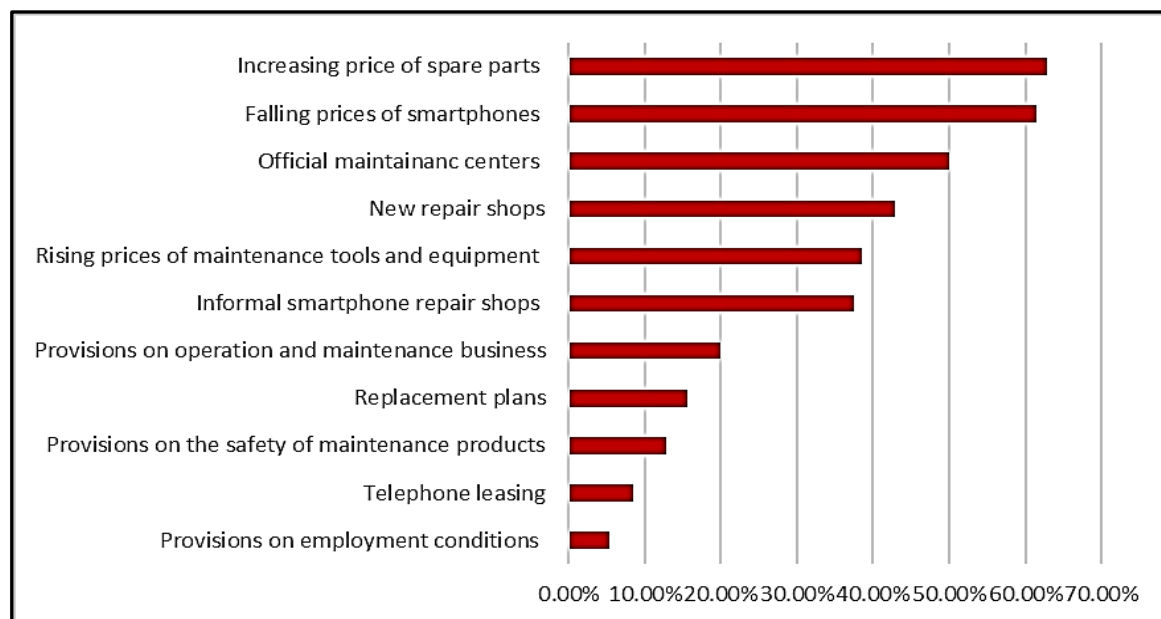


Figure 6. Business threats to mobile phone repair shops in China.

In interviews, Chinese interviewees noted that the increasing renewal rate of mobile phones is threatening their business. Many people will renew their mobile phone within 2–5 years. In the first

year, mobile phones are under the quality warranty period. During this warranty period, consumers will go to official repair centers for fixing their phone. After around 2 years, many people would prefer to replace a new mobile phone instead of repairing it. Several interviewees also said “Many people worry that private repair shops cannot completely repair their mobile phones or complain that the maintenance cost is too high. In fact, after the warranty period of the mobile phone, the repair cost in the private repair shop is lower than in the official repair center.”

Furthermore, with the frequent updating of mobile phones, mobile phone repair centers are also facing threats on the technology side. Our survey revealed that 71.42% of our investigated shopkeepers in China think that mobile phones are becoming more and more difficult to repair. Their feedback reflects that some issues of mobile phones are not easy to handle.

4.2.4. Supplier Relations

A total of 97.14% of respondents sources parts from China (home country); 68.57% of the parts are new (31.43% are used) and 84.29% require suppliers to provide warranty on these parts. Original new parts are sold by 77.14% and 50% quickly replace the parts supplier for cost reasons. Shops have formal contracts (30%) and informal relations (34.29%), and 35.71% have both. These findings indicate the knowledge and cost-based constraints of repair shops in China.

Regarding quality and price, it is said that “mobile phone accessories in China are adequate and inexpensive. The parts made in China can cope with normal repair work. Usually there is no need to use foreign parts”. The mobile phone industry in China has made rapid progress. More than 70% of the world’s mobile phones are produced in China and eight of the top ten mobile phone sales brands in the world are from China, making it the first option for mobile phone parts supplies.

4.2.5. Customer Relations

Phones are accepted by postal mail by 51.43% of respondents. A total of 75.71% repairs all types of mobile phones, and 31.43% even repair illegally made bandit phones. Warranty for services are provided by 74.29% of respondents, and 42.86% provide fee-based services other than repairs. For 65.71%, these services are an important source of their revenues, while 35.71% plans to provide fee-based services in the future. These findings indicate the increasing need of shops in being able to provide additional services surrounding repair activities in China.

It is said that “The online business system for mobile phone repairing in China is becoming popular and mature. Customers do not need to show up in our shops. Usually, we can receive customers’ orders on Taobao. Then customers will send us their phones and we send phones back to them after repair work finished”. This kind of online business mode offers convenience to both sides. The convenience is based on mature online communication and monitoring business system, and trust between the customer and repair shops. “The online order sometimes can be a big part of our business, this undoubtedly increases our income”, some interviewees said.

4.2.6. Circularity Oriented Economic Relations

In China, 24.29% of the repair shops are in touch with the refurbished manufacturers. Refurbished manufacturers source phones from repair shops (42.86%). While 24.29% buys a customer’s unwanted phone for repair and resale, only 15.71% of the repair shops sell refurbished phones. A total of 18.57% of respondents is more interested in using used mobile phone parts than in using original parts yet are respondents worry that consumers do not want such parts (61.43%). Warranty and legal requirements (34.29%) are the most important reasons why shops do not prefer using used mobile phone parts. Some interviewees stated that using used parts would save a lot of costs, but the quality of old parts is difficult to guarantee. Since the new parts are not expensive in China, the mobile phone repair shop owner usually uses new parts rather than old ones.

Regarding recycling, 58.57% of respondents has contact with recyclers, 61.43% also sells phones to recyclers, and 50% recycles phones other than repairing them. Many of the recycled used phones go

to professional “online trading system for second hand phones”, such as Taobao and Yiji. The used phones would be tested and given a recycled price. These findings indicate the increasing maturity of circular economic relations of mobile phone repair shops and the subsequent phone reuse and recycling business in China.

4.2.7. Planned Obsolescence and the Future of the Repair Business in China

In China, 50% of the respondents think that manufacturers can do more to avoid maintenance. According to the participants, manufacturers do not want to extend the use of mobile phones for more than 2 years (planned obsolescence). A total of 42.86% indicate software requirements and updates require that a new phone will be needed in any case. On the other hand, 55.36% still argue that if more people buy mobile phones, this will lead to more repair and maintenance demand; for 28.57%, more mobile phones sold would not make any difference to the demand for repair.

With regard to the future of the mobile phone repair industry in China, our respondents generally believe that the industry is in a period of decline. The main reason is that our respondents believe the profit margin of mobile phone repair is decreasing with the continuous upgrading of mobile phones, since the technical requirements for fixing high quality mobile phones, such as those of Apple, are increasing.

4.3. Poland

4.3.1. Informality and Transitioning to Official Repair Business

In Poland, before getting into mobile phone repair activity, interviewees had very diverse professional experience, such as production work, customer care, advertisement, or watchmaker. Also, education varies from general secondary school to higher education in IT or chemistry. Only 28.8% indicated that they worked in similar business—repairing phones or computers—before they opened their own repair shops, and 15.4% said that they repaired phones in an informal way before they started their business. Transitioning to an official shop can be done in a few months’ time.

4.3.2. Motivation Behind Establishing a Repair Shop and Profitability

In Poland, the most important motivation to open a repair shop is the expectation of high profits and the former business experience (important or very important for 86.5% of respondents). Almost equally important is the preference to be the owner (not to work for somebody else) and opportunity to work with people (84.6%). As many as 78.8% of respondents point out that they simply like the repair work. Furthermore, 61.5% mentioned low risk as an important factor. This indicates that in Poland, risk connected to the establishing of the repair shop is not considered to be low. At the same time, most of the respondents in Poland claimed that the company started to generate some profits as early as after one month (44.2%), while 23% indicated a period between 2 and 6 months. Usually, after taking the decision, it takes only 2–3 months to open the shop.

4.3.3. Threats in the Business Ecosystem

In Poland, generally, respondents are less likely to see changes in the environment as a threat to their business than in the Netherlands and China. Similar to the Netherlands, informal repair shops (44.2%), new repair shops and falling prices of mobile phones (both 38.5%), and increasing prices of spare parts are the biggest threats (32.7%). We can see that the same sources of threat are repeated between countries as being most relevant (Figure 7).

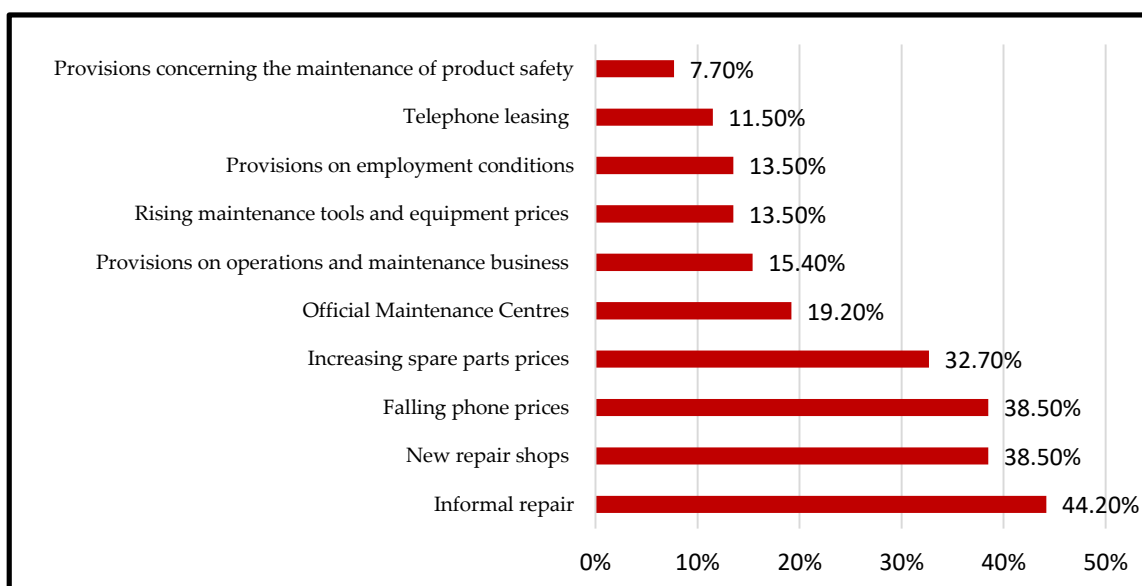


Figure 7. Business threats to mobile phone repair shops in Poland.

Additionally, respondents mentioned product change as a source of threat: progressing miniaturization already made some repairs very difficult and up to some point, may render it impossible.

The development of “non-repairable” mobile phones is seen by some as a purposeful action of the producers. Indeed, 69.2% respondents in Poland point out phones are currently more difficult to repair than they used to be. Moreover, 50% believes that competition increased in the last year, while 36.5% does not see the changes in this regard.

4.3.4. Supplier Relations

Only 23% (in comparison with 59% in Dutch context) of Polish repair shop owners change their suppliers quickly for cost reasons; 32.7% of owners base these relations on formal contracts, 48.1% rely on informal contracts, while 19.2% develop both formal and informal contracts. Almost all cooperate with suppliers in Poland (88.5%), while a considerable number also buy spare parts or tools from China (40%). A few also indicated countries such as Germany or England. Those who obtain supplies from China point out their low prices (76.2%) and wide assortment (61.9%). When parts are not available in Poland, they would buy directly from Chinese suppliers, in particular.

4.3.5. Customer Relations

Opportunity to work with people is highly valued by repair shop owners in Poland. To increase client satisfaction and, possibly, to generate the additional source of income, it is not uncommon for additional services are offered besides repair: 19.2% of respondents offer such services, such as parcel pick-up, short-term lease of electric equipment, or phone/computer configuration. Only for 5.8% of respondents did these activities constitute a significant source of income. The acceptance of phones sent by mail is widespread: 82.7% of respondents accept them.

4.3.6. Circularity Oriented Economic Relations

Similarly to the Netherlands, 26.9% of respondents pointed out that they have regular cooperation with remanufacturers. From this group, 57.1% have arranged the regular collection of phones from their repair shops. Only 34.6% of companies are in regular contact with recyclers, and from this group, 22.2% receive payment from recyclers for the phones which they pass to them. As much as 67.3% of

respondents also collect mobile phones beyond repair, while 42.3% buy used phones to sell later and 23.1% sells refurbished phones.

In Poland, 65.4% of respondents use used parts in their repairs, a share that is considerably above that in China (31.4%) and the Netherlands (5%). They point out the following reasons: limited access to new parts (70.6%), lower costs (38.2%), and customers' expectations (29.4%).

Environmental protection is less important (11.8%). Respondents point out that used components have higher quality—they claim that “it's always better to get the part from the original phone, rather than cheap replacement”.

All repair shops provide a warranty, usually for three months (63.5%) or six months (25%).

4.3.7. Planned Obsolescence and the Future of the Repair Business in Poland

More than half of the respondents in Poland (51.9%) believe that producers could do more to avoid the mobile phone repairs; in other words, they suspect producers apply a planned obsolescence strategy. In their opinion, producers do this because they want their customers to buy a new device after the old one is broken. Some of the research participants believe that the new mobile phone models are also designed to hinder the repair; currently, it may be even difficult to open the mobile phone to start the repair process.

The low level of perceived threats to the business signals the general optimism of Polish repair shop owners. This may result from their evaluation of the impact of rising sales of mobile phones: 73.5% of respondents believe that more mobile phones on the market will lead to more repairs. However, they also stress that it depends on the value of the mobile phone: the more expensive phones are repaired, while the cheaper phones are replaced.

5. Discussions and Conclusions

In this article, we examined the glocal competitive dynamics in the mobile phone repair sector in the Netherlands, China, and Poland. In doing so, the article contributes to the literature on the circular economy by offering an in-depth study of independent shops specializing in mobile phone repair in different local contexts, which emerged in a self-organized way, without special government innovation programmes and support schemes. The analysis was done with the help of survey questions with closed answer categories and open-ended questions, focus group meetings, and interviews of independent mobile phone repair shops operating in three different contexts.

5.1. Price Squeeze

Facilitating factors for the emergence of their businesses are: *the high prices of mobile phones, official repairs and original spare parts*; technical skills that were easy to learn; relatively quick time for repairs; and the possibility for direct contact with customers in shops. In all three countries, we observe a dynamic interaction between factor conditions and demand conditions in building up competitiveness.

For Chinese repair companies, the biggest business threats stem from rising prices of parts (62.86%) and falling prices of mobile phones (61.43%), followed by rising prices of maintenance tools and equipment (38.57%). The least significant threats include telephone leasing (8.57%) and provisions on employment conditions (5.36%). A negative factor for customers in China is the limited warranty that is generally available from Chinese repair shops, something which is not the case for the repair shops in the Netherlands and Poland because of EU regulations.

5.2. Increasing Technical Complexity

Our results and analysis indicate that changing factor conditions of technical skills play a crucial role for independent mobile phone repair shops. With advances in the mobile phone industry and increasing difficulty in reparability, in order to survive, independent repair shops develop skill-based strategies to cope with new knowledge needs. Keeping up with the new information and knowledge needs and requirements is a challenging activity for independent repair shops in the ecosystem.

Reparability is highly dependent on the choices of mobile phone producers in terms of durability, design, and provision of spare parts associated with their products. This constitutes a dynamic interaction between factor conditions and related and supporting industries, which has a direct impact on repair shops' strategy, structure and rivalry. People opt for mobile phone repair chiefly for financial and technical reasons of not being to solve the issues of their phones themselves.

5.3. Increasing Competition

Competition is increasing in the contexts of all three countries, with the Chinese repair shops more negatively affected by price dynamics than the shops in the Netherlands and Poland. To remain competitive, repair shops offer additional services in the form of selling accessories, mobile phone call credits, software recovery (e.g., support, reset and replace), followed by data-related services (e.g., data backup, transfer, recovery, memory reset).

5.4. Circularity Relations

Refurbished and repaired phones are common in all contexts, but in China and Poland repair shops have more intensive financial relations with recyclers than in the Netherlands. In all countries, refurbishment and reuse are common activities, in contrast to remanufacturing-related activities, which are still in an emerging stage. For mobile phone companies, remanufacturing is not a priority and neither is sourcing it out to third party suppliers. Remanufacturing and recycling firms are important for independent repair shops, i.e., to buy phones beyond repair from shops to recycle, or providing remanufactured phones to be sold. Nonetheless, such market transactions depend on the choices of mobile phone manufacturers and government regulations.

Relevant policies are Extended Producer Responsibility requirements that define the conditions in which an electronic product can or should be collected, recycled and recovered (e.g., WEEE (2002/96/EC); battery directives (2006/66/EC) in EU); regulatory reuse requirements; and warranty schemes for second-life products. This legislation regulates the activities of these supporting and related (remanufacturing and recycling) industries in business-to-business transactions, and, thus, their interaction with independent repair shops.

5.5. Policy Recommendations and Future Research Directions

Our case analyses reveal that the future of local independent repair shops dynamically depends on the circular choices (durability, design, and reparability) of global actors (e.g., mobile phone manufacturers) as key players, and outer-circle remanufacturing and recycling industries of a circular economy. While there are local economy and (digital) platform elements (of on-line repair manuals), mobile phone repair is not purely local because of the non-local availability of product components and materials. Profit levels are decreasing for independent repair shops. However, whether the viability of the sector as a whole is undermined by technical difficulties of repair that stem from design choices of global manufacturers using linear economy business models could be investigated further. Additionally, future research directions on local mobile phone repair may concentrate on the dynamics of global manufacturers' choices in using durable and easy to repair product designs, availability of spare parts for longer periods, and the dynamics of access to repair service documentation and software by third party shops and individuals.

The case of mobile phone repair shows possibilities for business-based circularity action at the local level but also demonstrates the importance of the supra-level (e.g., component suppliers and OEMs in other parts of the world, recyclers, national governments and the EC as the governing body of the European Union). To help mobile phone repair, EU and Chinese legislations could stipulate demands for reparability and information access. A complication is that the business of independent mobile phone repair is poorly organized, making it hard for repairers to argue their case to national or urban-level policy makers. The possibility to directly discuss issues of repair with mobile phone repairers and obtain additional services is greatly appreciated by customers, and a key reason behind

the existence of mobile phone repair businesses. Such activities are undertaken as part of global value chains and networks, in which the ties with remanufacturing and recycling firms are, so far, relatively weak. A notable development in this respect is the creation of the fair phone, which is innovatively using the demand side of its supply chain to drive sustainability [43].

Finally, it should be noted that product repair by independent shops is a business response to an economic opportunity. It is not based on shared value creation or sustainability thinking, which are motivators for repair cafés (engaged in the repair of household appliances and other mobile phones) and the (broader) movement of makers, modifiers and fixers [44,45]. Thus, such centers and cafés, and the dynamics of local socio-technical skill formation and non-market-based solutions in mobile phone repair, could be interesting topics of further research.

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Appendix A

Mobile Phone Repair Survey Questions

Establishing the Business (11)

- Q1 1. What are the activities your business is involved in?
- Q2 2. What is the share of revenue from repair activities in all activities? (%)
- Q3 3. Are you involved in the business of selling refurbished mobile phones?
- Q4 4. When did you enter the mobile phone repair business? (The year in which you became operational)
- Q5 5. How long did it take you to establish your mobile repair shop (from idea to becoming operational)?
in months:
- Q6 6. Before starting an official business, did you repair mobile phones on an informal basis? (yes/no)
- Q7 7. What business or other activity (education, unemployed etc.) were you involved in before you
established a repair company?
- Q8 8. What role did the following play in establishing a mobile repair shop?
The prospects of high profits
Low Risks
Previous Business Experience as shop owner
I like repair work
I like being a shop owner
Social interactions with customers
Other:
- Q9 9. How quickly was the repair of mobile phones profitable? Please only answer for activities related to
the repair of mobile phones. In . . . Months / in . . . years
- Q10 10. How many repair shops are there in your area (within 1 km²)?
- Q11 11. Did competition increase or decrease in the last year?

Human Capital Needs (2)

- Q12 1. How many employees do you have?
- Q13 2. On average, how many telephones could an employee repair per day? (a range can be given when people desire to do this, for example: 5 to 10 phones)

Part Inventory (9)

- Q14 1. From which countries do you purchase the parts (components)?
- Q15 2. If you purchase parts from China, why?
- Q16 3. Do you source parts via trade intermediaries? If so, in which country they are based?
- Q17 4. What percentage of the parts is new? ... % of the parts are new
- Q18 5. Do you ask for a warranty for the parts?
- Q19 6. Are you interested in using components from used phones more often?
- Q20 6.1 What are the reasons why you are more interested in using components from used phones?
- Q21 7. What is the most important reason for NOT using parts from used phones more often?
- It is easy to get original parts
- Legal requirements for warranty
- Fears that consumers do not want this
- Absence of warranty
- Other reason (e.g., negative image)
- Q22 8. Do you quickly change part suppliers for cost reasons?
- Q23 9. Is your relationship with suppliers based on formal contracts or informal relations?

Tool and Equipment Inventory (1)

- Q24 1. What is the origin of the tools to repair mobile phones? Please state the most important country e.g., China, other country (to be named)

Doing the Business (5)

- Q25 1. Do you repair all types of phones? Yes/no. If no, what phones do you not repair?
- Q26 2. Do you give a warranty? Yes/no. If no, what warranty do you give?
- Q27 3. Do you repair illegally produced phones?
- Q28 4. Do you offer payable services beyond the repair of components?
- Q29 5. Do such services constitute an important source of income for you?
- Q30 * Do you intend to offer payable services in the future?

Other Supply Chain Issues (7)

- Q31 1. Do you accept phones by postal mail? yes/no
- Q32 2. Do you have contact with remanufacturers? yes/no
- Q33 3. Do remanufacturers collect phones from your store? yes/no
- Q34 4. Do you have contact with recyclers? yes/no
- Q35 5. Do recyclers collect phones from your store? yes/no
- Q36 6. Do you receive payments for giving phones from recyclers? yes/no
- Q37 7. Do you receive or collect phones beyond repair? yes/no

Technical Capabilities, Infrastructure and Innovation (1)

- Q38 1. Have you bought new innovative tools and equipment in the last year? If so, what was new?

Customers (3)

- Q39 1. Do you buy phones from your customers for repair and resale?
- Q40 2. What percentage of your sales is from phones which are repaired and resold? ... %
- Q41 3. Do you foresee an increase or decrease in telephone repairs in general? Why?

Threats (2)

- Q42 1. What are the main threats for your repair business?
- Q43 2. Have phones become easy to repair?

Your Views (2)

- Q44 1. Could manufacturers do more to avoid the need for repair?
- Q45 2. If more people would buy the phone, would this lead to more repairs or less repairs, and why?

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