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Two-Sided Digital Platforms as Enablers for Circular Economy Business Models

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Abstract

The circular economy has become one of the most crucial business plans for organizations. There is rapid progress in using digital technologies, especially two-sided digital platforms as enablers for various businesses and start-ups to grow rapidly. However, these digital platforms are facing significant obstacles and barriers in advertising their products, growing sales, and improving profitability. There is not enough scientific research and scholarly work that has been undertaken or focused on the strategies to promote the circular economy from the aspect of information systems. The purpose of this research aims to explore the major possible contributing techniques that can be implemented to enhance the utilization of digital platforms as enablers for the circular economy. In this study, qualitative exploratory research has been considered as an adequate and suitable scheme for generating a contextual understanding of the phenomenon. 11 semi-structured interviews were conducted. The interviews were among individuals and within several organizations that are associated with the circular economy. According to the data collected from the survey, the most visible elements that affected the decision of the participants while using the digital platform are price, quality, sustainability, and location. Based on the findings, this study makes critical recommendations to tackle the problems that hinder the development of the circular economy among individuals, companies, and organizations. The recommended themes for circular economy strategies are to increase customer satisfaction, focus on opportunities, improve trustworthiness (online reviews), set up reliable return policies, and increase stakeholder engagement.

Keywords: Business Models Innovation (BMI), Circular Economy, Digitalization, Sustainability, Small and Medium Enterprises (SMEs), Business Model, Two-Sided Digital Platforms, Business Model Development.

1. Introduction and Research Question

1.1 Introduction

The circular economy is the model of production and consumption process that increases the utilization of materials and products as long as possible. It includes reusing, sharing, renting, repairing, refurbishing, and recycling. This can extend the life cycle of products and goods.

The Ellen MacArthur Foundation is one of the major global organizations that work and participate intensively to accelerate the transition to a circular economy. It promotes the idea of a circular economy among business enterprises, academic institutions, and governmental agencies to mobilize systems solutions toward reusing and sharing. According to the Ellen MacArthur Foundation, the circular economy aims to redefine products and services by

designing recycling processes to minimize the negative impacts of waste. This enables the circular economy to be considered as an alternative to a traditional linear economy which is based on the concept of “make, use and dispose of”. (Ellen MacArthur Foundation, 2018).

The EU parliament has defined the circular economy as the process where the value of goods, materials, and resources is remaining in the economic cycle for as maximum as possible, to minimize waste (EC, 2015).

Ekins mentioned in the workshop series named Managing environmental and energy transitions for regions and cities, that “the circular economy is one that has low environmental impacts and that makes good use of natural resources, through high resource efficiency and waste prevention, especially in the manufacturing sector, and minimal end-of-life disposal of materials” (Ekins et al. 2019[12]).

Despite the many definitions of the circular economy, all the definitions include a common essential assumption of waste prevention. Now the circular economy is going through a validity challenge period and facing a lot of obstacles, however, it brings a huge amount of business opportunities, especially for Small and Medium Enterprises (SMEs). The circular economy is about reducing and minimizing wasted resources through reusing materials, improving a sustainable design to increase the durability of goods and products, and transforming waste to be used as raw material for another manufacturing process. Many modifications should be considered in the traditional business models to achieve the transition from linear business to a circular economy.

Teece explained that a business model is the “design or architecture of the value creation, delivery, and capture mechanisms” of a business (Teece, 2010). This means that the business model can be considered as a mental construct that can be explained with visualization tools to clarify the organizational approach to how business works (Magretta, 2002).

Osterwalder and Pigneur defined business model innovation as a method for “creating value, for companies, for customers, and society”. Therefore, creating new business models for the circular economy concept could achieve a positive contribution to changing the customer behavior in society as well as improving the current economic situation (Osterwalder, Pigneur and Tucci, 2005).

Business model innovation (BMI) is continuous organizational procedures that aim to create, develop, diversify, obtain or transform companies’ business models to adapt to market changes (Geissdoerfer et al., 2018). Those procedures are consequences of change that could happen within the companies or outside the organizational boundaries (Foss and Saebi, 2017).

Platforms are products and services that bring together groups of people in two-sided digital interaction. They offer infrastructure and norms that support the transactions of the two

groups and can take numerous forms. In certain circumstances, platforms rely on actual objects, such as credit cards and merchant authorization terminals. In other circumstances, they are venues that provide services, such as shopping and services malls or websites like eBay and LinkedIn.

Two-sided platforms may be seen in various sectors, competing with traditional product and service offers. However, two-sided digital platforms vary fundamentally from other offers; in the classic value chain, value flows from left to right: cost is on the left, and revenue is on the right. Because the platform has different groups of participants on each side, cost and income are both to the left and to the right in a two-sided digital platform. The platform incurs costs in supporting both parties and can collect income from both, although one side is frequently subsidized.

1.2 Research Question

The circular economy is reasonably a new concept, so it is normal that it faces so many challenges. Using a digital platform can help in overcoming those obstacles. Previous research has been investigating the challenges facing two-sided digital platforms strategies for business models in general but there is a lack of research on how to overcome those challenges, especially in the circular economy fields. Most of the studies focus on studying the circular economy business model in general, therefore the focus of this study is to examine the circular economy from an information system perspective by exploring the possible methodologies of using two-sided digital platforms as enablers for the circular economy. Therefore, the research question has been formulated as follows:

How can two-sided digital platforms become enablers for circular economy business models?

Our key research question regarding the two-sided digital platforms for the circular economy has been inspired by previous work from the Harvard Business Review publication “Strategies for Two-Sided Markets which explains and investigates the strategies and the challenges that face the two-sided markets for business regardless if they are using linear or circular economy.

Another motivation for this study is that the research methodologies of the utilization of the two-sided digital platforms as enablers for the circular economy are suffering from a shortage in theoretical grounding which is necessary to recognize where to look, what questions to ask, or what the results take and why.

One of the major aspects to answer the research question is that there is a shortage of integration and implementation of the two-sided digital platforms in the business model innovation practices for the circular economy concept, which can be noticed clearly both in the literature publications and practical aspects.

In summary, the main objective of this research is to investigate the major challenges and opportunities of introducing two-sided digital platforms as enablers for the circular economy business models in different organizations and enterprises. Based on the literature review, the importance of answering this research question comes from the fact that exploring those challenges will assist those organizations and enterprises to improve their understanding in order to prepare a circular business model that works sufficiently in addition to exposing the expected potential opportunities. A qualitative research study has been conducted in order to conclude an answer to the above-mentioned research question. This study involves data from local organizations in Sweden that works in the circular economy sector as well as several online shared platforms and is conducted by interviewing business developers and customers who are interested in secondhand products, especially university students.

2. Related Research

This section discusses the research that has been conducted in relation to this study. It starts with research on the circular economy business model to present a general context for the issue. Then it explains the concept of how digitalization and digital solutions can boost the transformation toward circular businesses and industries. Lastly, a selection of strategies and challenges for two-sided digital platforms from information system literature was provided.

2.1 Business Model Innovation in the Circular Economy

It is highly expected that by 2050, there will be more than 9 billion people with an increasing total amount of wealth. This increase in wealth will lead to a global economic improvement in the industrial and business fields. This anticipated global economy will require a huge increase in raw resources compared to what we utilize today. To overcome this future challenge, the circular economy model provides the optimum solution (Godfray et al., 2010). Nowadays, most of business models are based on the linear economy which means approximately 80% of the materials we are using today are discarded after usage (Slowak and Regenfelder, 2016). There are other research claims that over 99% of the total material flow produced into consumer goods production may end up as waste in less than 6 months after the production (Collins, 2000).

Even though there is a big argument among researchers about the accuracy of those numbers, most of them agree about the fundamental necessity to change or find an urgent alternative to the current “make, use and dispose” model. This led to the emerging discussion about implementing business models that include more circular economy concepts in the utilization of the material to design and manufacture new products (Chen, 2020).

The concept of a circular economy has been around for decades, especially in academic institutions and R&D centers but the current climate change situation and the shortage and increase in the price of raw materials have prepared the market for the big enterprises and SMEs to take action toward the circular economy. The World Economic Forum, the Ellen

MacArthur Foundation, and McKinsey & Company have recently published a report explaining that the transformation to a circular economy will create a huge economic development that exceeds 1 trillion USD for the global economy until 2030 (Chen, 2020). The 1 trillion USD estimation, which is based on financial calculations, has increased the awareness of this topic as many corporations and SMEs started to focus on improving their opportunity to get a part of the potential revenue in the near future (Ellen MacArthur Foundation, 2016).

In the past years, many corporate managers and SMEs owners have dramatically changed the perception of circular economy ideas. This can be concluded in three major factors that led to this development. First, increasingly volatile commodity prices have fueled the need to safeguard the resource supply for manufacturing corporations. Secondly, information technology systems and the world wide web have worked as enablers for many new business models which weren't possible in the last decade. For instance, sharing platforms and smartphone apps have brought huge success to this new form of shared commodity usage. Thirdly, there is a trending phenomenon in consumer behavior toward sharing and reusing which is one of the fundamentals of the circular economy (Lange, 2022).

Commodity and raw material prices have decreased from 1900 to 2000 by an average of 1.2% per year, however, since 2000, most of the raw material prices have continuous rise and become increasingly volatile, which shaped the market and made it more appealing than ever for corporate managers and SMEs owner to recover raw materials from users at the end-of-life stage (Webster, 2013). We are at the beginning of the era of shifting consumer behavior from an individual ownership mentality to the sharing concept which increasingly forces and leads the manufacturers to focus on product quality and performance.

In general, the transition from the current linear economy to a circular economy necessitates four fundamentals:

- (1) Materials and product design.
- (2) New business models.
- (3) Global reverse networks.
- (4) Enabling conditions.

The circular economy has recently been seen as one of the major methodologies to play a major role in the transition to a more sustainable society (Geissdoerfer, Savaget, Bocken et al., 2017). Organizational structure and technological innovation are the core fundamentals that are needed to implement the transition toward a circular economy which leads to higher sustainability levels (Schulte, 2013). Moreover, a growing phenomenon and interest within the industrial fields and academic institutions is to implement the theme of business model innovation (BMI) towards circularity concepts (Diaz Lopez et al., 2019; Pieroni et al., 2019).

One of the major principles of the circular economy includes the goods of today are the resources of tomorrow at yesterday's prices (Stahel, 2016). Since circularity is a concept that has been dramatically developing then BMI is an essential concept to reveal new methods of providing value propositions to stakeholders and investigating economic and environmental

benefits for increasing the products' life cycle to systemically boost efficiency and effectiveness of the product utilization (Den Hollander and Bakker, 2016). Designing and implementation of the new business models introduced by circularity-oriented BMI are still facing many challenges for companies especially the SMEs although there is an increasing development of methodological support it gained during recent years due to the lack of new resources and raw materials (Blomsma and Brennan, 2017; Pieroni et al., 2019).

2.2 Digitalization Transformation toward the Circular Business

Antikainen and Valkokari classified and summarized the circular economy barriers in the digitalization era as below:

1. Company internal organizational structure and environmental culture
2. Shortage of capital, and financial resources.
3. Insufficient governmental support, legislation, and powerful regulation.
4. The difficulties in finding information
5. Enormous administrative burden and responsibilities,
6. Poor technical practices and technological competencies including know-how.
7. Lack of support from the supply network and demand arrangements (Antikainen M & Valkokari K, 2016).

The importance of digitalization as a major facilitator of a circular economy is well acknowledged. Digital technology and interconnected devices have the potential to minimize resource use and facilitate circular systems. However, there is currently a limited number of studies on how Digitalization will accelerate the transition to a circular economy (Bressanelli G, Adrodegari F, Perona M, & Sacconi N, 2018). Pagoropoulos conducted a literature review, which obtained 12 studies on circular economy and digital technology (Pagoropoulos A, 2017). Similarly, Tseng et al conducted a literature search on "Data-driven on industrial symbiosis" and found 20 papers, only a couple of which were linked to smart manufacturing and sustainability (Tseng, 2018).

Recent studies perceived digitalization as a method to open up new opportunities by providing data on the location, condition, and availability of items. They emphasized the need for open, accurate, and large data sets in decision-making. Digitalization promotes novel digital platforms and facilitates the development of new types of markets based on the virtualization of products and processes. Digitalization also makes networking, cooperation, and communication with stakeholders easier, more convenient, and more efficient. Digitalization encourages user engagement in product and service innovation processes while also assisting firms in reaching and interacting with consumers more effectively (Moreno M, 2016).

Industry Digitalization allows for more efficient use of fewer resources. Smart solutions offer reduced energy usage, more effective logistical approaches, and productivity improvement.

Digitalization allows transparent access to data on product resource usage, allowing for the optimization of product life cycles and so promoting the CE (Kagermann, 2015).

Digital technologies assist in the collection of information on how a product has been utilized, which is critical in product-service systems related business models. This information may be utilized to estimate the quality of returned items and to simplify the flow of returns into product life cycle management (Pagoropoulos A, 2017). Bressanelli et al investigated how Cloud Computing platforms, Big Data, and associated analytics aid in the transformation to the circular economy. These technologies provide several functionalities including improving product design, attracting target consumers, monitoring and tracking products, giving technical assistance, providing maintenance, optimizing product usage, updating the product, and boosting renovation and end-of-life activities (Bressanelli G, Adrodegari F, Perona M, & Saccani N, 2018).

Large volumes of data are present in circular economy systems with interconnected cycles. Digitalization opens up new opportunities for accessing this information. Decisions must be taken based on the phases of the product's lifetime, how waste materials should be reused, what manner of logistical arrangements are required, and who the participants in the value network are (Salminen V, 2017). The virtualization of distribution channels is made possible by digitalization. Customers can receive value through digital channels such as online stores and digital items. This can result in lower ecological consequences and circular business models (Lewandowski, 2016).

Coordination of material and information flow is essential in the circular economy. Data about the amount and quality of goods, as well as their raw material content, must be gathered and saved. Digital technologies allow data to be kept together with materials in the cycle and wastes can be used as a resource (Wilts H, 2017). Integration of digital intelligence allows for the distribution of information, structure, ownership, and many levels of customization. This enables better engagement and long-lasting interactions with consumers and end-users. Furthermore, digital technologies allow circular business models and strategies through automated resource and material flow monitoring, control, and modification. One significant facilitator of customer engagement and interactive relations is social media. Furthermore, as a result of digitization; marketing is evolving to become more dynamic, smarter, and productive. Finally, Digitalization helps to reduce costs and boost efficiency, especially resource efficiency (Moreno M, 2016).

2.3 Circular Economy Digital Solutions

The most often recommended solutions were collaboration, networking, enhancing accessibility, and sharing information. Collaboration through sharing expertise and merging competencies from many sorts of players is a promising solution. The players should come from all industries and include both small and major organizations. Collaboration between businesses and academic centers in education needs to be expanded. Networking with foreign partners such as corporations, and non-governmental organizations would also provide a potential to develop solutions to the difficulties. Furthermore, communication

and networking with domestic partners could be expanded. Research programs that bring firms together would also boost networking chances (Bressanelli G, Adrodegari F, Perona M, & Saccani N, 2018).

The digitalization potential associated with the circular economy revolution can introduce new virtualization-based opportunities. Virtualization may be a significant facilitator in adopting a circular business model focused on slowing, closing, and/or narrowing the loop, helping to decrease costs, save resources, and provide accurate and trustworthy data. Virtualization may also be of tremendous assistance in building modular, repairable, and easily manipulated goods, which is a crucial enabler in embracing circular business models (NMP, I, C, & B, 2016).

The circular business model proposes that the ecosystem, rather than a single company, closes the loop on many companies. As a result, networking and communication with stakeholders, as well as new partners, are required to enable circular business models. While completely new goods and services are required, collaboration with stakeholders and customers should be considered a digitalization-enabled possibility (Bressanelli G, Adrodegari F, Perona M, & Saccani N, 2018). Digital collaboration platforms using virtual technologies play an important role in networking and creating smart partnerships. Furthermore, we know that consumers, as early adopters of innovative products and services, play a critical role in the circular economy transformation. Digitalization facilitates contacting and engaging with consumers, which is required for developing creative circular business models (Ghisellini P, Cialani C, & Ulgiati S, 2016).

This necessitates a shift in marketing from one-way to two-way communication especially Two-Sided Digital Platforms which allow effective cooperation, and data sharing challenges that need to be addressed. Establishing trust and security in data exchange are major difficulties that may be met with creative technical solutions, such as the use of blockchain technology. When factoring all of those challenges, our study is a step in the direction of understanding the role of digitalization in the implementation of Circular Economy-based business models (Ghisellini P, Cialani C, & Ulgiati S, 2016).

2.4 Strategies and Challenges for Two-Sided Digital Platforms

The two groups in two-sided are attracted to each other — a phenomenon that economists call the network effect. With two-sided network effects, the platform's value to any given user largely depends on the number of users on the network's other side. The value grows as the platform matches demand from both sides. For example, video game developers will create games only for platforms that have a critical mass of players, because developers need a large enough customer base to recover their upfront programming costs. In turn, players favor platforms with a greater variety of games (Alstyne, 2006). As a result of network effects, successful platforms enjoy increasing returns to scale, since users will pay more for access to a bigger network, so margins improve as user bases grow. This feature distinguishes network

platforms from the majority of traditional manufacturing and service enterprises. Growth beyond a certain point in a traditional business frequently results in lowering returns; acquiring new clients becomes more difficult since fewer individuals find the firm's value offer compelling. Competition in two-sided digital platform sectors may be severe, driven by the prospect of increased profits. Platform leaders might use their larger margins to invest more in R&D or decrease their pricing, thereby pushing out weaker competitors. As a result, established two-sided network businesses, such as the credit card industry, are often dominated by a number of big platforms. In extreme cases, such as PC operating systems, one or two businesses emerge as the victors, capturing nearly the entire industry (Alstyne, 2006).

Systems that support two-way digital platforms are not a new phenomenon. Energy corporations and manufacturers, for example, have a well-established network that connects gasoline-powered automobile drivers with refill stations (Alstyne, 2006).

Platforms have grown in popularity in recent years, owing primarily to technological advances. New platforms have emerged, and established firms have been reconfigured as platforms (Google, for example, connects marketers and Web searchers). Electricity markets are growing into platforms that connect consumers with individual power suppliers, allowing people to express their preferences for more expensive renewable energy and less affordable coal (Alstyne, 2006).

Despite the potential benefits, platform providers have struggled to establish and maintain two-sided digital platforms. Their failures were caused by common errors. Those common errors are related to the following challenges:

Challenge 1: Pricing the Platform.

Challenge 2: Winner-Take-All Dynamics.

Challenge 3: The threat of envelopment and making it first to the market.

One of the common mistakes managers do when developing strategies for two-sided networks, is they usually rely on concepts and patterns that apply only to industries that do not have network effects. As a result, they've made a lot of policies that are completely unsuitable for the profitability of their industries, pricing is the most important decision here. However, producers of a two-sided digital platform can generate income from both sides, and in most circumstances, it makes sense to encourage certain consumers. The key strategic question is which side should you subsidize, and for how long to get higher revenues (Alstyne, 2006).

The following stage is to determine how to control winner-take-all dynamics. Many two-sided network sectors are nearly exclusively supplied by a single platform. In certain circumstances, such as Amazon auctions or Microsoft's Windows, a single business controls the platform. In other circumstances, like the DVD and fax standards, or a regional multiple listing service in real estate, numerous enterprises share the main platform. When it is

anticipated that a network sector will be covered by a single platform, prospective providers must make a decision, whether they should strive for exclusive control of the platform or share the profits with competitors (Alstyne, 2006).

Platform providers that have defeated their direct competitors cannot rest on their dominant success. Indeed, they face a serious competitive challenge from large firms in related areas that can provide a multiplatform package. This challenge is a major difficulty and it needs creative solutions continuously for businesses who are facing it. The last consideration is the concept of moving first and growing swiftly aren't always the best options but it depends on the market situation (Alstyne, 2006).

3. Research Methodology

This section covers the research methodology that has been used in this study. The section starts by indicating the reason behind choosing the methodology, followed by the process of collecting the data and sampling, then data analysis, and finally explaining ethical considerations and limitations.

3.1 Choice of Method

The research started with conducting a literature review to find the knowledge gaps in a circular economy sector that has a solid connection within the Information System (IS). In the data collection, we focused on conducting a semi-structured interview which was the main source of data. Finally, the analyzing process has been implemented to come to a conclusion and a set of recommendations and suggestions for future improvements.

3.2 Qualitative Method

Since the research is focused on exploring, understanding, and interpreting the root cause of the phenomenon and concept under investigation, therefore, a qualitative research method is the most appropriate approach and that is why it has been selected to collect the data for this research. (Creswell, 2003).

Strauss and Corbin (1998) mentioned that qualitative research is one of the best methodologies to investigate matters related to experience issues, cultural phenomena, and social dilemmas. The qualitative approach is considered to be one of the best methodologies to interpret the research question and reveal the non-numerical understanding within the social phenomena context. They indicated that the reasons behind this conclusion are three key elements. First, qualitative research methods are suitable to understand the core concept of a phenomenon since it gives you a general headlight about it (Creswell, 2003). Second, the flexible nature of qualitative research methods regarding the process or phenomenon that is under investigation by the researchers. Third, the qualitative approach is important and essential to interpreting the complication of human mentality behavior and the complexity of the social relations within different societies (Sofaer, 1999).

Utilization of the two-sided digital platforms as enablers for the circular economy could be considered a new phenomenon and a complicated process. This is mainly because it requires involving many stakeholders in different stages of determining the requirement, designing the prototype, and planning implementation before the execution within levels in a timely manner. Moreover, the qualitative research method was used in this work because it provides a depth of knowledge to experience issues, cultural phenomena, and social dilemmas. In addition, the circular economy business model concept is still a field that is under-researched and in continuous change which makes quantitative research to be not preferable in those kinds of research.

3.3 Individual Interviews

The interviews as a qualitative research method technique concerned with managing intensive and in-depth dialogue meetings with a certain number of participants to explore and investigate their points of view on specific ideas, programs, or situations related to the research under study. There are 3 different formats for conducting interviews for scientific purposes which are structured, unstructured, and semi-structured. The semi-structured format will be used in this research study (Boyce and Neale, 2006).

Semi-structured interviews are based on using a question guide that has been prepared by the researcher (See Appendix 1). This guide assists the researcher during the interview to get more details and clarification for the open-ended questions. It contains a combination of components between structured and unstructured interviews. In semi-structured interviews, the interviewer must prepare and construct an identical set of questions to be answered by all participants in the interview process. However, some additional questions can pop up during interviews to get more explanations for certain answers and/or further expanded clarifications about certain unclear issues.

The most important advantages of the interview methodology in general and particularly in semi-structured interviews are that the researcher has direct management and control of the flow process for collecting the primary data and has the flexibility to add more clarifications about uncertain issues that may appear during the interviews. The flexible nature of the semi-structured manner gives the possibility to ask extended questions related to the questions in the guide and related to new aspects mentioned by the interviewers to enhance the information and data quality for this study. This type of interview was used because the research question required interaction between the interviewee and the interviewer to get a deep understanding of their point of view regarding the challenges and opportunities of the utilization of the two-sided digital platforms as enablers for the circular economy.

However, the researcher has to try to avoid the difficulties and disadvantages related to using the interview methods; like it may require a longer time compared to other data collection techniques. Furthermore, the researcher must consider the challenges of organizing and planning a suitable timetable for the sampling group to be interviewed.

In addition to that, Semi-structured interviews construct mostly from open-ended questions that enable the interview to be more flexible and adaptable to discuss issues that arise spontaneously from the interviewee's answer and get the opportunity to collect more solid data (Doody & Noonan, 2013). Therefore, the researcher must be open-minded to different points of view and opinions from the participants in the interviews. Not only accept, but as well not display any kind of disagreements if interviewees expressed a viewpoint that contradicts the researcher's ideas and beliefs. Moreover, interviews must be conducted in environments that are free of any form of pressure, tension, anxiety, or whatever can negatively influence interviewees (Boyce and Neale, 2006).

3.4 Data Collection

The aim of this study is to investigate the utilization of the two-sided digital platforms as enablers for the circular economy. The qualitative method is completely suitable to explore this aspect because it would provide a golden opportunity to find a unique set of data. It is essential to capture the whole data content in its surrounding natural environment while conducting interviews, observations, and other conversational settings (Denzin & Lincon, 2000). This concept matches the research objective since the target is to explore and get a deeper understanding of the key stakeholders' points of view and how they perceived this project.

The semi-structured interviews were conducted using questions guide with around 12 questions, most of them asking for open-ended answers to allow the interviewees to express their opinion and points of view in the best possible manner. Also, it enables the interviewer to ask follow-up questions and gain more clarification and justifications from the participant in order to reach richer data and understand the full picture and the different aspects of the open-ended answer (Doody & Noonan, 2013). According to Harrell & Bradley, the open-ended answers from the participants during the interviews can give the researcher more understanding of how the customers behave toward using digital platforms as enablers for the circular economy (Harrell & Bradley, 2009).

Conducting two pilot interviews allowed the recognition of the questions set that help to achieve the purpose of the research and the other group of questions that don't work or don't enrich the collected data. Those initial interviews assist in modifying the difficult question that the respondents struggled with to make them more convenient and easier to answer. During those questions' modifications, it has been considered the respondents' different backgrounds, years of experience, and knowledge of our respondents about the circular economy and its digital platforms. Those changes included adding more detailed follow-up questions and shortening others based on the experience of the participant with the circular economy and the digital platforms. Another minor adjustment has been done to the interview guide after the fourth interview due to the different elements among the interviewees including their location and academic background. To improve the quality of the collected data during the interviews, an initial copy of the guide was sent to the

participants before the interview started. This was one of the changes that were added after the fourth interview. This step helps the participants to have enough time to think about the answers and draw a roadmap and more attention to the nature of the questions. Also, it helps them to understand the estimated time that interview may take. The total number of interviews conducted was 11 interviews.

There were 3 factors among the elements that have been considered in the selection process of the respondents. The willingness to participate, availability, and finally involvement and level of expertise. Willingness was the most important element since applying any kind of enforcement will contradict with the ethical aspects of the research. The second element is availability; since some of the targeted respondents were willing to participate but were not available for different reasons including busy schedules or sickness. The least important element was expertise level as one only needs to be familiar with the main concept or have previously been involved in using digital platforms for any essential circular economy activity which could be as simple as looking for or buying second-hand items through an online platform. The participants varied from students with not much experience in the circular economy to business developers who have been working for a couple of years to improve business models and assist companies to adopt different circular economy methods.

The interviews were between 19 minutes to 56 minutes, with an average of 33 minutes. The overall duration of the interview was 65 days from the pilot interview to the 10th interview. All of them have been conducted online through a Zoom and google meet application while utilizing the recording feature.

All the interviews were in English which is one of the drawbacks since English was the second language for all the respondents. Using the mother tongue would have helped the respondents to express their ideas in a more convenient manner but on the other hand, it would have increased the duration of the data collection process since translation must be done during the transcribing process and it may need more time and sometimes the ideas may slightly change during that process. The transcription has been done to all the respondent's answers using a semi-automatic feature by Microsoft Office 365. This feature helped in making the first draft of the interview, but the researcher had to correct the draft since this new feature is still in the development process with so many mistakes in capturing the words.

All the interviewees were given the chance to introduce themselves by asking some personal questions before starting to answer questions from the interview guide. This assisted in setting the tone and building an initial connection between the interviewer and the participants.

Doody and Noonan (2013) mention that semi-structured interviews are the most common type of interviews used in qualitative research. The preformatted questions in the guide aim

to collect the same set of data from the participants by asking the interview questions. Also, this guide created a sense of order in collecting the data.

The process of determining the appropriate participants was relatively easy since the author was involved in the circular economy business for more than 5 years with an excellent network. Another factor was the author's background of working in developing IT systems for about 8 years. This combination allows the author to directly contact the respondents after the initial version of the guide question was formulated. Most of the participants were connected through email or business social networks like the LinkedIn network.

Overall, 11 participants were interviewed for this study, they are IT developers, business consultants, students, business developers, and regular customers. The students from different university levels including bachelor's, master and Ph.D. They have a solid background in using the digital platform to buy most of their needs from secondhand shops since they believe in the circular economy and sharing as a way of living. The business consultants and developers were from several public and private organizations and all of them live in different Swedish cities. Some of them are experts in the circular economy implementation in the public sector and one of them was a business developer who is working at a startup company to promote the circular economy through developing their own digital platforms.

Respondent	Role	Organisation	Duration
Respondent 1	IT Developer	A	37 minutes
Respondent 2	Student	B	34 minutes
Respondent 3	Business Consultant	C	45 minutes
Respondent 4	IT Developer	D	19 minutes
Respondent 5	Student	E	41 minutes
Respondent 6	Student	F	39 minutes
Respondent 7	Regular Customer	G	26 minutes
Respondent 8	Business Developer	H	56 minutes
Respondent 9	Business Consultant	I	51 minutes
Respondent 10	Business Developer	J	49 minutes
Respondent 11	Business Consultant	K	36 minutes

Table: List of Respondents, respective roles, organization, and interview duration

3.5 Data Analysis

The thematic analysis approach was used to analyze data since it produces a deeper understanding of the results and leads to providing better answers to the research questions (Braun & Clarke, 2006). All the interviews were in English to ease and make it convenient. The interviews were then transcribed and analyzed by making "open codes" and color-coded to generate key themes categories (Charmaz, 2001).

The thematic analysis method utilizes the concept of identity, analyze, and report themes within data by minimally arranging and extracting the data set in a rich detailed context (Braun and Clarke, 2006).

The thematic analysis method is commonly used to analyze different types of qualitative data such as interviews, focus groups, and field studies since it organize and describes data with rich details (Braun & Clarke, 2006). Using this method has assisted in summarizing the responses from the transcripts of the interviews which lead to extracting a solid conclusion and better understanding of the phenomenon.

The decision of using the thematic analysis method as an analysis method for the collected data from the interview was due to the flexible nature of the methodology combined with its accessibility and ease of learning even with basic academic fundamentals and a bit of experience in qualitative research methodology. However, it provides a deeper explanation and description of the data set and summarizes the major characteristics of large data. In addition, it identifies the similarities and differences across the categories of a large data set. The thematic analysis method was the optimum and most convenient for analyzing the data of this research. Therefore, it was applied to analyze the collected data after the data had been collected successfully and the recorded interviews were transcribed to the best possible.

Based on Braun and Clarke (2006) the thematic analysis consisted of five steps. All those 5 steps were followed to retrieve the primary and principal patterns of the collected data. Those steps include the following:

1. Familiarization of data

The main purpose of this step is to familiarize the researcher with the data set by carefully reading the interviews (Word by word) and trying to recognize the general opinion of the respondents and figure out a common understanding. This should enable the researcher to highlight the important concepts and determine potential interesting items

2. Generating initial codes

The next phase involves the creation of initial codes. The goal of this phase is to systematically analyze the data through coding (Braun and Clarke, 2006). The data was reviewed thoroughly, and coding was initiated using the direct words from the data. The main goal was to uncover the challenges facing the utilization of the two-sided digital platforms as enablers for the circular economy that has been mentioned by participants in the interviews. To capture all aspects, the analysis was proceeded line by line, and all available data were coded.

3. Searching for themes

The goal of this phase is to identify potential themes from the previous step. We searched for initial codes and began to group the codes into themes according to their similarities. Since

the themes are formulated based on the initial codes, we stayed with the data that are closely associated to answer the research question.

4. Reviewing potential themes

The fourth step consists of examining the themes that are mainly connected to the research questions. The previous step themes have been reduced by extracting the most significant and crucial ones to answer the research question and increase the understanding of the phenomenon.

5. Creating final themes

In the final step, the previous themes were renamed and edited to make them understandable to all. It was also double-checked that the final themes reflected the analysis and that they were consistent with the literature review.

3.6 Ethical Aspects Considerations

This study is related to the circular economy and digital platforms which are mostly affected by changing customer behavior. It is important and critical to have enough knowledge about the research's ethical aspects and considerations in general and particularly in the EU Sweden. Vetenskapsrådet developed four basic standards to be applied for individuals' protection during the research studies. These standards are information requirements, confidentiality, use requirements, and consent requirement (Vetenskapsrådet, 2002).

In order to achieve the goals of the study research and answer the research questions, the literature review and individual interviews will be used as different qualitative methodologies for collecting data. Many ethical aspects and considerations should be applied by the researchers' team while carrying out these different kinds of qualitative methods.

Primarily, the participants in the interviews should be totally free and they naturally want to engage in the study without any kind of pressure or force to contribute to the research study. Moreover, their consent will be recorded and documented after taking their permission (Ritchie et al 2014; Dalen 2015).

Therefore, any personal information like names, contact numbers, type of employment, or any information that can be related to the individuals who are participating in the study must be counter-measured. By applying all the above ethical considerations, the chances of identifying the participants in the data collection process are considered very low or almost non-existent (Ritchie et al 2014; Dalen 2015).

The research team will also notify the candidate participants that all their information will be anonymous and confidential in the study. Moreover, the collected data will be used only for the pre-defined purpose of the study. All the participants will be informed about this information twice, once when the researcher contacted them for the first time to discuss the

study and then again before the beginning of the actual interviews. By these double confirmation procedures, we can guarantee that this information has been clearly delivered to all the participants and to ensure that they freely want to take part in the study. Since the research team will be recording and transcribing the interviews and the related discussions, they will ask all the participants for permission to record before starting.

In this work, all the interviews were conducted online and recorded by zoom or google meet after getting permission from all respondents. Moreover, all respondents had been informed about the ethical considerations that will be followed during conducting the whole study. All the participants had been informed about the research purpose and that the record interviews would be only used for the aforementioned purpose.

The most critical and essential ethical element in this thesis was to protect the respondents by keeping all their personal information confidential and reducing the possibility to identify them to the minimum. An agreement with the participants to mention only their job titles and maybe the description of their duties (if needed) since that information would strengthen the quality data collection process. Another factor that was agreed on is to keep their contribution to the final copy of this thesis anonymous.

To summarize, it was avoided to ask any sensitive information during the interview, and most of the questions were about expressing their personal utilization of the two-sided digital platforms' as enablers for the circular economy. In addition, the research was conducted by following all the above-mentioned ethical considerations in each stage from informing all the selected participants in the study that they have the right at any time to draw out or withdraw their participation till the final stage of transcribing the interview in the best possible manner.

3.7 Non-Disclosure Agreement for Classified Data Covered

The research study was related to a growing project and the results of this work will be part of the development project in a startup company. All the collected data and the project result are governed by a non-disclosure agreement (NDA). Some of the collected data was considered to be a part of the interview context but it needed to be approved or modified by the company that owned the project. This approval was important to be accomplished due to some of the respondents' wishes and to avoid any kind of conflict that could happen in the future. This was another drawback in the study since some of the answers were modified to be general answers without containing some details that related to this company's project.

4. Findings and Results

In this section of the thesis, the findings from the data collection process will be presented in detail. This chapter covers the strategies to overcome the challenges facing the utilization of

the two-sided digital platforms as enablers for the circular economy. Five distinct themes are associated with the suggested answers to the research question.

The themes will be presented here in addition to any interdependent relationships between them, those five themes have been extracted from the content-coding of the interviews. The themes for those strategies are:

1. Customers Satisfaction

All of the respondents mentioned at least one customer satisfaction element as the main factor associated with the two-sided digital platforms' strategies to overcome the challenges facing the utilization of the circular economy. They emphasized that applying procedures to improve the quality of the product and reduce the prices of the items purchased online can increase the possibility of buying secondhand products. Respondent one explained that by saying:

“When it comes to using secondhand objects or new objects then it depends on the type of objects or the product that I am going to buy. I usually buy used objects or secondhand objects but there are multiple factors that I can consider. First, the quality of the product I mean the condition of the product itself. Is it in a good condition or not? And the price of this product, Is it competitive against the new object or not? and finally the trustworthiness of the seller. Can I trust the seller or not? I think these are the three are the most important when it comes for me to make a decision on buying a second-hand product”. (Respondent 1)

In the same context respondent, two expressed the same opinion. She explained how affordability and Quality vs Price are the main elements that motivate her to buy secondhand items. She also added the location and environmental aspects:

“In general, I like to buy secondhand items. But I can say that affordability, price, and environmental factor are the most factors that can affect my decision to buy a secondhand item. For example, how clean is the item and the price must be reasonable, and the effort that I need to do in order for me to bring the product into my place for example if it is even cheap and very clean but it's outside of my city then I will not buy it, so it has to be close to me. but I would say that among those factors the price is the factor that motivates me the most to use secondhand items.” (Respondent 2)

Also, respondent six agrees with respondent two on the 4 elements including price, sustainability, quality, and location:

“Usually, I do buy second-hand products. To buy, first I look at the price and then the environmental aspect. Yeah, the quality affects my decision, yes of course if it's not a good second hand then I would prefer to buy new. Also, I like the location of the seller to be nearby, it's better, especially if it's a big item, I prefer that location will be close to home because I don't have a car. Between all of the factors, price, sustainability, quality, and location, I think the one that is affecting my decision the most is the quality.” (Respondent 6)

Respondent five and respondent four added that the type of the product can affect their preference to buy new or secondhand products regardless of the price factor.

“Mostly I buy new items but if I find a good secondhand item and it was affordable; I get it for sure. I measure it by its value to its price, I would say if it's in a good condition, like an item itself or the product itself is in a good situation and the price is not expensive, I would get it but if it's in a good situation and the price is kind of close to the original one, I get the new one. for example, if I want to buy a jacket I try and see if the jacket looks good like there's nothing wrong with the jacket and as I said before the price should be around 50-70% then I can buy it.” (Respondent 5)

and respondent four mentioned

“I like them both, but it depends on the type of the product. Sometimes I prefer buying second-hand and sometimes I buy new. For personal stuff like clothes, for example, I prefer buying new ones. For, mobile phones I prefer also new ones, but maybe for a TV or something less personal then it depends on the functionality if it's a well-functioning then I prefer the second-hand one. The quality is the most that affects my decision.” (Respondent 4)

Finally, respondent three highlighted an important aspect of how the community around him has taught him and motivated him to buy secondhand items

“It depends on the item but yes in Sweden I mostly buy second-hand stuff I also buy new things as well. Since I moved to Sweden, my decision to buy secondhand items is mostly affected by many reasons. The obvious reason that the new products are usually more expensive, and the other reason is that there are so many well-maintained used items available so why pay a higher price for new item. There is another reason that there is no need to buy a new item if you can reuse it from someone else. If we want to talk about the circular economy and recycling stuff because I like it myself, I also sell my used items and I buy secondhand used items and I think this is a good way I wish that all society can operate. I think, society is the reason why I started being motivated to buy secondhand things.” (Respondent 3).

2. New Opportunities

Many of the interviewees express their deep belief in the significance of digital platforms and the chance they can introduce in promoting the circular economy. They also mentioned the necessity of collaboration between society's different stakeholders in addition to the importance of connecting available resources with the manufacturers and customers who are in need of it. According to most of the respondents in this research, the two-sided digital platforms strategy is an essential element to create opportunities and is a key factor to promote any product or service regardless of the field. Digital platforms also present ways to resolve some challenges that were impossible to solve before the digitalization era.

“Digital transformation does not discriminate on the type of service. Digital platforms will be able to solve issues in processes that are not possible to solve without digitization.” (Respondent 9).

In the same context respondent ten shares the same opinion about his deep belief in utilizing digital platforms.

“I definitely believe in using digital platforms. Even, I would like to say that it is a necessity and a prerequisite for enabling a circular economy. The circular economy requires new business models and collaboration made possible via digital platforms.” (Respondent 10)

Most of the interviewees talked about opportunities that can be created by adopting digital platforms to promote the circular economy for both society and organizations within different phases.

“I would say to promote circular economies, digital platforms are still super-efficient, and I would say for a long time it will be the main channel in the industry and definitely will become more and more relevant regardless the business type” (Respondent 3).

In the same context respondent eleven shares a similar opinion about the added value, the future potential, and the positive effect of using digital platforms. He explained how digital platforms can boost the collaboration between the different institutions that work in the same field.

“Digital platforms have the potential to showcase circular solutions and enable new collaborations. I think circular solutions is about connecting resources and people to be able to close the loops of materials” (Respondent 11).

3. Trustworthiness - Better Reviews

The majority of the respondents explained the issues related to trustworthiness and how they believe it will increase the reliability of any IT system to be used as a digital platform that aims to change the mentality of people about using the circular economy. Users need to feel that they are getting the correct and complete information about the secondhand products before paying. Many of the participants stated the importance of trustworthiness and how it is associated with the quality of the product which has a direct effect on the price. For example, respondent one mentioned trustworthiness among the important elements he considers before buying a secondhand item.

“When it comes to using secondhand objects or new objects then it depends on and finally, the trustworthiness of the seller. Can I trust the seller or not? I think these are the three most important factors when it comes for me to making a decision on buying a second-hand product”. (Respondent 1)

Then he added

“I trust the local platform because I can actually go and talk to the seller over there, I can look at the products myself and I know that if I had any complaints this seller is going to be easily reachable. Unlike other platforms like Facebook marketplace and Blocket, for example, once the seller is done with you in the Facebook marketplace, he could just block you which is a big problem for me after the sale. Facebook and Amazon are completely different platforms; I do use Amazon a lot and I trust Amazon but not the people who are selling on Amazon and I always do a lot of research before buying a product from Amazon.” (Respondent 1)

Another participant explained how the lack of trust could be one of the major challenges that could face the person before paying the money

“I bought secondhand items that were bad, and I regret the purchase, but I also bought some items, and they were really good so yes sometimes the trust is a challenge but as long as I can check the item before picking it up and see it before paying the money then yes, I think I'm fine. For example, I agree that Amazon and those other websites can add more credibility and trust and not like Facebook because in the social media platforms I need to do all the quality check myself, I need to go there to see the item and test it for some time until I pay for it. I think yeah but on Facebook and Blocket but Amazon and eBay I just ordered, and I trust the quality and I trust the seller.” (Respondent 3)

Also, some interviewees mentioned a positive point of view regarding the reliability of the reviews on those platforms.

“I always look at what the people are saying in the reviews, are they giving the product a very good review or a very bad review, and then I look at the seller's reviews himself. For me, the reviews are trustworthy based on Amazon criteria.”. (Respondent 1)

In the same context, participant three stated that the reviews always help him to evaluate the quality of the product and make him be willing to pay more for the product if the reviews are good and how using the reviews system has increased his trust in the platform.

“When I buy from Amazon, mostly I check the reviews and I see the pictures of the item with other people using it and that's really useful and makes me comfortable to pay a big price for the item and just trust the quality, so I think yeah I need to double check the items and the sellers on Facebook and Blocket. But on Amazon and eBay I can just order since I trust the quality and I trust the sellers. I think the review is OK if the reviews have images and videos in addition to the text then I rely on them but if the review is just text and someone is saying something most of the time, I don't read them or I don't trust them I just assume that those are the seller friends or something but as long as I see pictures in the reviews then I trust it more.” (Respondent 3)

On the other hand, some respondents explained why they didn't consider the review as they believed that anyone could write anything about the product. For example, respondent four has the same concern regarding trusting the reviews.

“I don't care about the reviews so much because people can write anything. very often I buy secondhand items, maybe once every two months or something like that. Also, social media doesn't affect my decision to buy a product. If I want to buy something, I read about it online like some articles or I read about the specification of some brands and then I put my quality limits and then I search for that as I read about the product to know what suits me better and what not then I chose what suits me best and then buy that simply.” (Respondent 4)

Also, respondent five was one of the respondents who are always looking for platforms with a good reputation, but he does not rely on the individual product's reviews and he is willing to pay if he is buying from a platform with a good reputation.

“Commonly I don't rely on the reviews. For the secondhand platform, I would only pay more for the item if the platform is well-reputed and if a lot of people suggested it. But, in general, for me to be honest once there is a good reputation and people love it, it doesn't matter that the platform is a specialized platform that sells one item or sells 10 items then I'm ready to take the risk and buy from that place even if I have to pay maybe a 10% more, I will do it in order to get a solid item at the end.” (Respondent 5)

4. Return Policies

The return policy was another topic that many participants were not aware of when it came to buying secondhand items. For example, respondent five even with his deep belief in the word of mouth from others, he didn't trust in utilizing the advantage of the return policy since he completely relies on double-checking the product before buying it

“If I could take the word of mouth, yes I would take it, and if many students actually suggested a certain shop for a particular item then I will go there. But as I said before that I don't rely on the reviews and I don't rely on the return policy of the websites sometimes people get paid to make a good review of certain items” (Respondent 5)

Respondent four completely disagreed with respondent five on the return policy since the return policy is the main reason that he relies on while buying the secondhand item online.

“In general, doing online shopping for new items is OK but I don't shop online for secondhand items, I can consider buying secondhand items from websites like Amazon and eBay which are well-known websites for buying new and secondhand stuff since they can get the product for me to check it and they have a return policy that will not cost me anything so I can get the opportunity to check the item and then keep it or return it without any

additional cost. I used Facebook marketplace before but upon agreement on buying the item, I go check it before I pay or before I make the final decision about the item.” (Respondent 4)

In the same context respondent three shares the same opinion about the advantage of the return policies. He mentioned:

“Most people criticize Facebook marketplace that there is no mechanism that you can double check the seller compared with the other platforms such as eBay and Amazon. Also, eBay and Amazon have a free return policy which can be combined with the reviews to help me make the decision of buying the product or not” (Respondent 3)

Respondent one was happy with the feature of returning the product after checking it.

“I will look into the guarantees that Amazon provides for me and I know that Amazon will always accept the return for the product whether the seller accepts it or not. So, it's a quite different story between Amazon and Facebook.” (Respondent 1).

5. The stakeholders' Engagement

Most of the respondents agreed that changing customer behavior is one of the key challenges that face the promotion of the circular economy. This could be achieved by involving them in the planning, designing, and implementation of the transition toward using more sustainable green products.

Respondent eight highlighted some details about what should be considered. For example, including the requirements and input by engaging the users.

“However, engaging the stakeholders in the planning and implementing process is a must to guarantee the right functional platform implementation, which might need the assistance of experts in the design in an early stage before getting to the implementation of any platform and after collecting the requirements from the end users.” (Respondent 8).

Respondent nine opinion was directed toward how to embed the culture of circular economy: “The issue with the circular economy is not how the digital platform is implemented. It's more about maturity in mindset, behavior, and culture. To be able to succeed to promote a circular economy, the platform needs features to promote circular behavior and mindset. It also needs to remove obstacles connected to egoism.”. Then he later continued “The biggest challenge is to involve human behavior in the equation, the digital platform will not solve anything without the users being committed. There is a need to address all the issues of egoism that will be the easy way out.” (Respondent 9).

Respondent ten argues that there is no difference in implementing all types of digital platforms since all of them need a clear vision and mission before implementation. Therefore, he thinks that the customer's engagement should come at a later stage after designing and establishing the Minimum Value Product (MVP) of the digital platform.

“Regarding implementing platforms in the circular economy, I do not think it is that much different from other types of platforms. There must be a clear Minimum Value Product (MVP) for both the producers and the consumers, and that the user-friendliness and the design are appealing, and the later needed features should be added in an agile manner.” (Respondent 10)

Respondent eleven discussed the different ways to implement the circular economy platform between the public and private sectors.

“My experience is that circular platforms can be implemented in different ways. Private companies have the possibility to launch platforms that enable their business idea and use a platform for serving their customers. It is possible to connect existing resources with new customers.” (Respondent 11)

Then he added

“For the public sector, it is also possible to promote circular platforms to promote circular initiatives. In my experience, it is important to do this promotion in partnership with the private sector, academia, and organizations in the circular economy. One of the main reasons for this is to support the ecosystem needed for the circular economy and to get an overall perspective of the progress.” (Respondent 11)

Finally, respondent eight explains two stages that in his opinion are extremely critical to implementing digitalizing to promote the circular economy. He explained:

“When looking in-depth into the circular economy, we can identify two different phases or stages where digitalizing and platform can be supportive, first one is the transition stage to a circular economy for both society and organizations by creating digital access to the verified methods and other resources including both knowledge and financial resources which can facilitate the transition process into the circular economy. The other stage is the implementing of certain processes and visualizing specific circular economy business models such as the sharing economy model and cooperative digital platform.” (Respondent 8).

5. Discussion, Recommendations, and Limitations

In this chapter, the outcomes and results were reviewed and linked to the related research and literature review chapter in order to answer our research question of how to overcome the challenges that are facing the utilization of the two-sided digital platforms as enablers for the circular economy.

5.1 Discussion

In the following, the detailed analysis of the study results will be reviewed and associated with our research question.

There is a lack of research publications on how to overcome those challenges, especially in the circular economy fields; particularly using the two-sided digital platforms strategies as enablers. The extant literature provides little empirical guidance on how to utilize the two-sided digital platforms' as enablers for the circular economy.

Our findings revealed a number of strategies and succeeding in applying those strategies can assist in overcoming the barriers that face promoting the circular economy and can have profoundly positive consequences for those digital platforms. The study revealed 5 strategy themes namely customer satisfaction, focus on the new opportunities, trustworthiness, return policies, and stakeholders' engagement. These strategies are discussed in alignment with extant literature in the below paragraphs as follows.

Godfray et al., (2010) highlighted the high expected increase in the total amount of wealth which will lead to a global economic improvement in the industrial and business fields. This is in line with our research finding of the enormous number of new opportunities that could be achieved from using digital platforms in circular economy related businesses, since they can introduce optimum possible solutions to reach this financial gross. For instance, five of the respondents underlined that those platforms would deliver a wide range of future opportunities to reach this progress. This is also supported by the report published by The World Economic Forum, the Ellen MacArthur Foundation, and McKinsey & Company in which it has been mentioned that the global economy until 2030 will be about 1 trillion USD (Ellen MacArthur Foundation, 2016).

One of the participants talked about how private companies can launch their own circular economy platforms to serve their customers but the lack of knowledge on how to do it could be considered as a real struggle. He also added the importance of the involvement of the public sector to participate in solving the problem of creating a smooth transition by establishing initiatives to overcome the major challenges. Clear examples of those obstacles are insufficient governmental support, effective legislation, and the implementation of powerful regulations which have been discussed by Calogirou (Calogirou, et al., 2010)

Liu, Y.; Bai, Y explained the struggle of SMEs to apply the transition from the traditional linear business model to a circular business model due to a lack of technological know-how (Liu, Y & Bai, Y, 2014).

A participant who is a business developer added the importance of the collaboration between startups, SMEs, and public institutions which can participate in resolving the problems. Furthermore, Parker mentioned the need for the involvement of all supply chain partners and to build trust bridges between the stakeholders. They consider trustworthiness as one of

the key factors for individuals and organization development which can help them to expand their business network to achieve more sales and profitability (Parker, C.M, Redmond, J, & Simpson, M, 2009).

Another participant discussed that to build this trust we need to work in two different directions. The first direction is to establish a collaboration between the private and public sectors. In the second direction, he explained how the online review systems can positively or negatively affect the platform's trustworthiness. This statement has been strengthened by 5 more participants' responses, who mentioned how the online product reviews have a huge effect on their evaluation of the product quality and how much they are willing to pay slightly more to buy secondhand products with better quality. Therefore, there is a connection between the reviews and the motivation to buy secondhand products which can lead to customer satisfaction in the future.

The majority of the interviewees consider price, quality, sustainability, and location as the main elements that motivate them to buy secondhand items. Almost all of the participants mentioned that the price can be considered among the two most important elements they keep in mind during the purchase process. This highlights the importance of the price, which matches and falls in line with what has been mentioned by Alstynne that following a well-defined pricing strategy is a crucial process to motivate customers to utilize the two-sided digital platforms as enablers, however, many managers still make mistakes during the pricing process mainly by not taking into consideration and not assessing all the related issues when developing strategies for prices on the digital platforms (Alstynne, 2006).

Moreover, many of the interviewees talked about quality as an important factor and how using digital platforms made it easier for customers to buy the product online. The feature of the reviews system and the advantage of the return policy resulted in making the customers rely more on digital platforms in evaluating the products' quality. To ensure the products have the required quality, the sellers need to apply predictive maintenance concepts which can lead to increased product reliability, availability, and system stability. Also, applying past product knowledge enables product life extensions to improve future remanufacturing (Ellen MacArthur Foundation, 2016). Knowledge of the product's availability and usage instances via digital platforms and markets may lead to increasing the recycling potential (Stankovic M, Gupta R, & Figueroa J, 2017).

Stakeholders Engagement is one of the key features for businesses to succeed, and hence the consumers are the majority of the stakeholders in using the digital platforms as enablers for the circular economy, therefore, it is important to improve consumer knowledge about the benefits they can gain from using sustainable products. Stakeholders' engagement is an essential process in changing consumer behavior toward making a habit shift to purchasing green products (Wycherley, 1999).

One of the research results explains that the digital platform can struggle to work unless there is maturity in the mindset of the society and the existence of the stakeholders' culture of changing customers' behavior toward more sustainability. One of the respondents added that the stakeholders should be included in the planning and designing process to improve functional performance during the platform implementation. This is associated with what was mentioned by Edbring that the transition to a circular economy necessitates a shift in consumers' lifestyles and behavior as well as confronting the circular economy's challenges. Edbring also added that customers may be resistant to changing their perceptions of consumption and ownership since products are perceived as markers of social standing, which is directly related to what is mentioned by one of the respondents, that egoism and the need to own items should be changed by establishing more sharing initiatives that are managed through digital platforms (Edbring, et al., 2016).

One of the participants discussed the two essential stages that must be included during the designing and implementation of digital platforms for the circular economy. He indicated the first stage is to create methods and provide resources to include society before working on the second stage of developing business models such as the sharing economy and cooperative digital platform. To implement what he mentioned, we need to convince and push the decision makers of the SMEs to change the company's environmental culture and to consider implementing more circular economy tactics (Dekoninck, E.A, et al., 2016). This should be achieved by including the public and private enterprises, as one of the participants stated that those platforms can help private companies to increase their customers and assist them to expand their business idea. For the public sector, he highlighted the importance of establishing initiatives for governmental support, financing opportunities, and training, as well as setting up effective taxation policy and introducing standards, and powerful regulation to overcome the lack of global governmental support and effective legislation which is recognized by Parker as a major barrier to the implementation of environmental programs (Parker, C.M, Redmond, J, & Simpson, M, 2009).

The significance of digitalization as a remarkable enabler of industries and businesses is well recognized around the globe. Digital technologies and networked devices have a high potential to reduce resource use and facilitate the development of circular systems. (Moreno M, 2016). New business models that include new technologies such as cyber-physical systems, Big Data, data analytics, and the Internet of Things (IoT) may open up massive opportunities for a more sustainable business generation with a wide range of industries, including the startup that are mostly promoting and establishing circular economy projects (Raynor ME & Cotteleer MJ, 2015).

Many of the business developers who participated in the interviews have described digitalization as a game-changing digital technology that is currently revolutionizing the industry and businesses. They believe applying digital transformation is a necessity and a prerequisite for enabling a circular economy and will be the main channel for expanding sales and increasing profitability in the industry regardless of the business type. Cloud

computing addition to data analytics and information systems makes this expansion possible. This description may be combined with one of the respondents' statements who added that digital platforms can help in addressing problems that were difficult to handle before the digitization era.

Furthermore, the rising use of recent digital technologies such as artificial intelligence, cloud computing, and big data offers novel possibilities for improving traceability and transparency across the product life cycle (Stankovic M, Gupta R, & Figueroa J, 2017). Those technologies can enable manufacturers to monitor, manage, evaluate, and optimize product performance while gathering consumption data with smart products. (Porter ME & Heppelmann JE, 2015). Also, real-time product location knowledge can improve product accessibility and enhances end-of-life collection, refurbishment, remanufacturing, and recycling possibilities. Product condition knowledge enables circular economy forecasting, predictive maintenance, enhanced exams, and component prognostics (Bressanelli G, Adrodegari F, Perona M, & Saccani N, 2018).

5.2 Social Considerations

Recently, the social aspects started to play a major role in accepting the new technologies by the customers and the communities. We can consider the utilization of the two-sided digital platforms as enablers for the circular economy as a new innovative business model solution. It will face the social acceptance problem that is facing most of the new technologies system, which will create an obstacle to taking the step from the research and design stage to the industries and business markets. Therefore, the social aspects related to the circular economy and two-sided digital platforms will be discussed in this study.

There is a lack of studies in the circular economy related fields from the information systems perspective. During establishing the digital platform, the developers usually run the risk of examining and studying what is observable rather than what needs to be studied and analyzed. This problem appears especially when researchers attempt to make causal normal claims from the datasets and totally abandon and neglect the probability prospect to discover or confound something new using the hidden factors related to the social behavior of the customers. The only optimum fact is that the more data is available, the more theoretical knowledge and practical techniques are needed to know exactly what to look for and how to understand and interpret the results and outcomes.

To achieve favorable and successful outcomes for presenting any new business technology, the researcher and designers should keep attention to the social considerations and factors that enable the new technology to be fully accepted by the community and by the individual end users as well. Moreover, the final product design should naturally interact with the customers and sustain their passion and desires in a fashionable way.

In the near future with the increase in the enforcement of the circular economy, social acceptance is expected to get better, because the utilization of the two-sided digital platforms as enablers for the circular economy is becoming more and more applicable.

Finally, despite all of the challenges and obstacles, there are still sufficient reasons to be more optimistic about the future social perspective of the utilization of the two-sided digital platforms strategies as enablers to promote the circular economy in the next decades and to expect potential positive influences on social activities. However, it is important to be aware of the social considerations including the methodological, theoretical, and practical factors associated with this research because social-related sciences will cause an effect on the research results.

5.3 Recommendation:

Digitalization can assist in overcoming the challenges and reducing the difficulties that digital startups and SMEs face during the scaling-up phase of a new business model innovation that implements a circular economy. On the other hand, new technologies and digital transformation can assist in effectively enhancing the use of two-sided digital platforms as enablers for the circular economy. To effectively enhance using two-sided digital platforms as enablers for the circular economy, recommendations were proposed in accordance with the literature and the findings from this research:

1. Enhancing customer satisfaction:

The lack of concern for the satisfaction of customers can cause a significant slowdown in growth for a large number of startups' digital platforms all over the world. Therefore, customer satisfaction should be a top priority because it is one of the primary factors that directly affect the profitability of the business, which can be achieved through merging the use of two-sided digital platforms in the process of implementing the circular economy over the long term. If achieved, increasing the level of satisfaction of the customers will result in positive financials and more profit, as a satisfied client becomes a regular and loyal customer, and this will clearly show through the rising numbers of supply and demand rates, as well as additional gains to the business's image and reputation can be accomplished by increasing the level of satisfaction of the customers.

Traditional surveys were one of the best tools to gain knowledge of what the customers want but the possibility of using the track and trace online tools to know what customers need has opened new opportunities for SMEs. Google Analytics and social media tracking tools could be good examples to know what the customers need. For example, price is a big factor to achieve customer satisfaction so it would be an excellent idea to know if the customer took a long time to buy the product after adding the item to the cart. Also, it could be possible to see how long the customer took in every page on the website or the app through data analytics or using AI techniques.

Customer satisfaction can also be achieved by paying attention to the customer's demanded needs, which can be fulfilled by improving the quality of the secondhand products that are sold online at prices that are competitive with those sold in traditional stores. Furthermore, even so, it could come with additional expenses, but it is highly recommended that SMEs should focus on the development of customer service, which can be implemented through staff training to be instantly active and to provide the highest levels of assistance and support because we may risk the platform to fail completely in reaching the target audience without this proper staff training. This is even more important in the platforms which are in the growing phase however the need for staff training could be less important in a well-established platform such as Amazon and eBay. Another important discussion is about whether it is better to outsource customer support or to make it a part of the two-sided digital platform. Also, keep in mind the different kinds of users who are using the platform for example Uber has drivers and people who use the app to travel as different types of users, and each of them has different needs.

In addition, utilizing the digital platform will increase the communication channels with customers and will give them the flexibility of different methods to express the issues they are facing which will ultimately help increase the level of satisfaction. Hence it is highly recommended to monitor customer satisfaction and focus on increasing it which will impact the effectiveness of the two-sided digital platforms and vice versa.

2. Focusing on the opportunities toward more sustainability:

The fact that easy access to internet services and digital online-based platforms, especially two-sided digital platforms offers various options for customers and sellers beyond the confines of time, region, and financial boundaries. This makes it clear that there is a necessity to pay attention to finding new creative opportunities to integrate the digital methodologies in the SMEs' circular economy business models which can lead to reaching the overall goal of those SMEs to make more steps toward sustainability.

Using two-sided digital platforms to investigate these opportunities is recommended as it will assist businesses in reducing the costs of the old offline marketing campaigns, identifying specific targeted audiences, and broadening customer coverage in any given area especially the circular economy since the circular economy implementation is connected to changing the customers' mindset of using second-hand products. For example, the utilization of two-sided digital platforms can enable customers to find products on any global platform without incurring the costs of commuting to physical shops which can be considered as an opportunity that needs to be undertaken. Moreover, two-sided digital platforms can also provide opportunities for online projects, collaboration, and partnership for talented organizations and individuals regardless of where they are physically located. In addition, digital platforms can identify new trends in online advertising by utilizing a variety of social media platforms.

3. Increasing Reliability and Trustworthiness:

It is common knowledge that one of the most significant drawbacks of online shopping is the possibility of receiving package specifications that do not correspond with the order that was placed. As a result of the prevalence of this problem, many customers choose to avoid using digital platforms in favor of shopping in physical stores. This could be easier to implement in a well-established platform compared to a new platform. For example, hotels.com could make policies to make the hotels follow certain procedures to increase reliability through uploading more images and videos to the platform to enable the customers to evaluate their services before completing the booking process.

It is recommended to remedy such trust issues in the digital platforms by including detailed information regarding the product's quality, material, sizing, and color tone, in addition to pictures of the exhibited product taken from a variety of different angles. Additionally, the implementation of an advanced reviewing system that not only includes regular written opinions and comments but also includes media uploads, photos, and videos will increase the credibility of the digital platform among its users.

4. Applying a concise and transparent return policy:

A significant number of the individuals who took part in the interviews for this study stated that an online return policy is an essential component in determining whether or not to make a purchase and that a transparent return policy provides customers with the assurance that the platform is confidence worthy in term of the quality of their products and that the item they are purchasing is what it is claimed to be, as well as the knowledge that they can return the item if it is not up to the required standards.

Therefore, it is recommended to have a clearly stated and applied flexible return policy that will enable the digital platform to not only keep its existing customers but also win their trust and encourage new customers to join and make use of the platform's services. The return policy should be clear, concise, and unambiguous.

5. Engaging the stakeholders:

It is essential and crucial to involve all of the platform's stakeholders in the design and planning stages in order to achieve the best possible user experience on the platform. This will allow for the creation of a welcoming environment to discuss ways to improve things and express ideas.

It is recommended to include the engagement of stakeholders in the setup process of the digital platform from the beginning as it will enable the delivery of the required product/service with an excellent user experience. This will be accomplished by allowing frequent users, companies, and individuals to address their needs and wishes for products and services on the digital platform and taking that into the execution phase with the assistance of a professional IT/programming team.

In conclusion, this study shows how two-sided digital platforms can enable the circular economy business model by developing a list of recommendations based on literature and an empirical study as shown in the discussion section based on five different main areas mentioned above and it depends on the two-sided digital platforms owners to exactly decide in detail how to implement those recommendations and what to do in the respective area depends on what stage the two-sided digital platforms currently is, the character of the organization and also how much they can afford to pay to implement those recommendations.

5.4 Research limitations

There are a few elements that hindered this research study. A number of important limitations were considered as follows:

- 1) The lack of literature on this topic was the main limitation in the literature review step as most of the prior research focuses on circular economy plan activities and processes, while less research has been conducted on how to handle challenges and opportunities from the Information Systems (IS) point of view. Nevertheless, a number of research and publications had been used in the literature review to support the participants' results. Studying the circular economy from an information system point of view is a relatively new topic with few experts. Finding suitable experts and business developers to interview and discuss the related issues in detail was a big obstacle.
- 2) Finding respondents with both IT and circular economy backgrounds to participate in the interview was difficult. The difficulty was that the participants had good knowledge of the circular economy, but the majority didn't have a solid IT and digital platforms background. Moreover, most of the two-sided digital platform strategy involves confidential information about the IT infrastructure and business plans, including digital platforms' technical specifications and future marketing plans, which prevented many people from participating, and some of them needed to ask for permission from top management.
- 3) The collection process of the primary data from the participants about their companies and governmental institutions' records was difficult to conduct and needed many connections to build trust between the research team and these organizations. Moreover, the senior management staff members were not motivated to share their views on the topic because it might affect the future strategies of their organizations and SMEs.
- 4) Qualitative research is typically open-ended questions, individuals have more control over the collected data. Therefore, it makes it difficult for the researcher to objectively

compare and validate the results against the situations described by the respondents. Many people's personal ideas, viewpoints, and experiences must be gathered for qualitative research. Due to the nature of qualitative data, researchers must go through each individual response to gain a more comprehensive understanding of why participants felt or reacted to a business in a specific manner.

Finally, Sincere efforts were put into the study to overcome these limitations and challenges. The target was to increase the effectiveness and proficiency of the final output results to be applicable.

5.5 Suggestions for Future Research

The research sample is small and not diverse as all the participant and their organizations are in Sweden only, which makes it difficult to apply the findings to different businesses and industries all over the globe. However, the goal of this research was to explore different ways to overcome the barriers to using two-sided digital platform techniques as enablers for the circular economy. This study will serve as a foundation for future research that dives further into the issues. Further studies are recommended to look at specific concerns or explore more ways to address these issues. More case studies from organizations that have implemented two-sided digital platforms as enablers for the circular economy are also recommended.

6. Conclusion

The purpose of this thesis was to investigate the challenges and benefits associated with the utilization of the two-sided digital platforms as enablers for the circular economy in organizations and businesses. As a concluding answer to the research question, it can be argued that two-sided digital platforms can be used as enablers for the circular economy. However, applying this concept is faced many challenges which can be resolved by improving the customers' satisfaction, reducing the prices of the products that are sold through digital platforms compared to the ones that are sold through the physical shop, and by focusing on the opportunities that can be added through using the digital platform. All will lead to increasing the customer base with less cost compared to the offline traditional marketing methods.

In addition, providing easy and cheap or free return policies and improving the quality of the online reviews toward making those platforms more trustworthy will lead to changing the customer behavior to be more motivated to use those reviews in evaluating the quality of the secondhand products. Finally engaging the stakeholders in the design and the planning process will facilitate and improve the performance of the digital platform.

In conclusion, the combination of the above-mentioned recommendations and suggestions can play a significant role in advancing the use of two-sided digital platforms as enablers for the circular economy since they are interconnected and overlapped. Furthermore, those

recommendations can be used as an initial analytical tool by SMEs and organizations to examine how they can involve the utilization of two-sided digital platforms in their circular economy business models. Hence applying all of those recommendations combined will strengthen the overall common objective of changing the individuals' behavior, organization strategies, and communities' mindsets toward using more sustainable choices. Therefore, I believe, those recommendations are theoretical contributions to literature in the fields of circular economy and two-sided digital platforms fields.

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Appendix 1: Interview Guide

Introduction Questions		<ul style="list-style-type: none"> • How is your day going and how is the weather in your city today? • What is your educational background? • What is your profession? • how long have you worked at the circular economy/digital platform?
General Questions		<ul style="list-style-type: none"> • What is your experience when it comes to using digital technologies in your work, especially two-sided digital platforms? • Do you use any digital technologies during buying second items? If yes, which ones do you use? • In your opinion Does the use of digital technologies make any change to the circular economy
The Challenges	The strategies	The questions
	The challenges	<ul style="list-style-type: none"> • What are the most factors that affect your decision to buy secondhand items? • Among the following factors: <ol style="list-style-type: none"> 1. Price 2. Single/Multi options 3. Partnership with housing company to include the flat furniture, • What of those 3 elements motivate you the most to utilize a secondhand item, and why?
Challenge 1: Pricing the Platform	User sensitivity to price	<ul style="list-style-type: none"> • How can the price affect your decision to own/utilize secondhand items? • What is the price range percentage you are willing to pay for a secondhand item with good quality?
	User sensitivity to quality	<ul style="list-style-type: none"> • How can the quality affect your decision to buy a secondhand item? • Knowing that there is cheap maintenance in a nearby bike maintenance center, How can this impact the level of quality of the item you are planning to select?
	Ability to capture same-side network effects.	<ul style="list-style-type: none"> • How does the word of mouth among the students impact your decision to use secondhand item?

	Ability to capture cross-side network effects.	<ul style="list-style-type: none"> Does having multiple secondhand products in one platform with a delivery service can motivate the idea of using more circular economy products ?
	Users' brand value	<ul style="list-style-type: none"> Does the product brand affect your decision in utilizing products that promote the circular economy and sustainability? Does the review from our old customers in the social media platforms and forums affect your decision to buy from a certain company?
Challenge 2: Winner-Take-All Dynamics	Share the platform	<ul style="list-style-type: none"> How often do you use platforms to buy secondhand stuff? What of the following platforms you are using more often to buy secondhand: Facebook marketplace, Blocket, Tradera? What do you think about having one local platform in your city for a secondhand shop or physical secondhand mall? What is best for your customers and your company? To have a single platform or use a public platform like social media? Why? What are the factor need to need consider in the digital platform? How digitalization can boost the using of circular economy? How we can motivate the customer to use circular economy platform? What are the challenges during using/developing two sided digital platform?
Challenge 3: The Threat of Envelopment	Envelopment	<ul style="list-style-type: none"> What are the sustainable values that can be added by including the item among the furniture in the flat? What do you prefer while you are buying a items? Why? <ul style="list-style-type: none"> a) a Platform that focuses on different product types or b) a Platform that has different sections from different products. How much are you willing to pay monthly in case the free maintenance was included in your flat furniture?