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# Circular Economy for Clothes Using Web and Mobile Technologies—A Systematic Review and a Taxonomy Proposal

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**Abstract:** Nowadays, it is possible to buy clothing using online platforms, either by accessing online brand stores, general online stores or circular economy platforms. This paper presents a study on mobile applications that support online commerce for clothing, focusing on the review of the mobile applications with features that are characteristic of the circular economy paradigm. Findings include the fact that almost all the mobile applications analysed have pictures illustrative of the clothes and accessories that are available for trading as well as their brief description. Furthermore, this paper presents a study of various scientific articles about the circular economy of clothes and how it can be beneficial to the future of the environment. It is a junction with a Web platform for its growth and its disclosure. The paper builds conclusions upon the assumption that the circular economy is a growing business that is part of a sustainable development where the main goal is to reduce the environmental impact. The paper proposes the analysis of an innovative taxonomy of mobile applications about the circular economy.

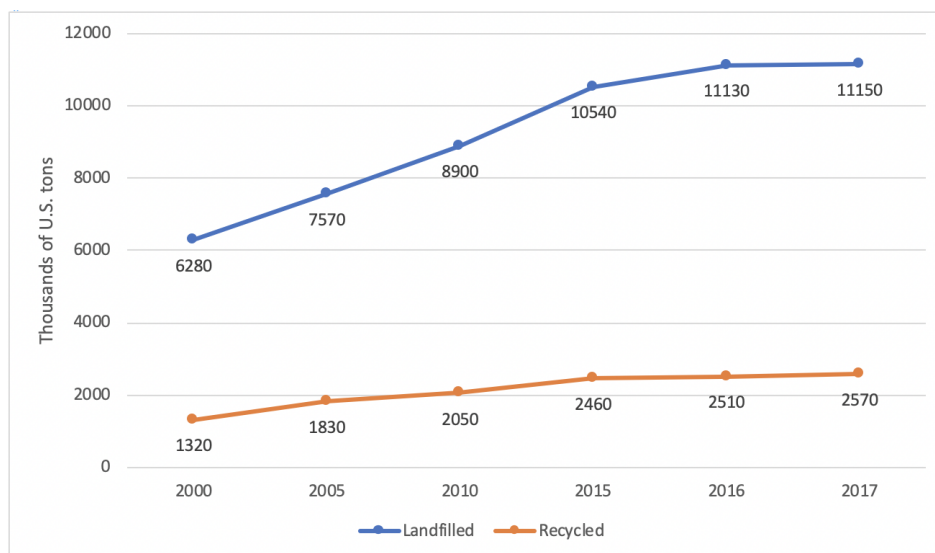
**Keywords:** clothes; circular economy; exchange; textile; mobile application; web platform

## 1. Introduction

As the amount of online commerce (also known as e-commerce) and online trading (also known as e-trading) transactions and the use of mobile applications increase in our day-to-day life, one of the possibilities includes buying, loan or exchange clothes using the Internet [1,2]. These platforms include the mobile platforms that support the e-commerce or e-trading of clothes and the emergence of activities of the circular economy [3–5]. The wide variety of platforms allows for a timely review of the existing platforms as a means to conclude on the most common characteristics and the rarest features [6,7].

The textile industry is on top of the oldest and most relevant industries and associated with the increase of the global population; there is a clear tendency in textile production [8]. The United States Environmental Protection Agency (EPA) estimates that the textile industry produces 16.9 million tons in 2017 and reports that the recycling rate for textile products was 15.2% in 2017, corresponding to 2.6 million tons [9].

The evolution of the landfilled tons of textiles produced and recycled in the 21st century is represented in Figure 1. From the analysis of Figure 1 is possible to conclude that the increase evolution of textile waste assumes a significant role in the sustainable management of world resources.



**Figure 1.** Landfilled tons of textiles produced and recycled in the 21st century [9].

On the one hand, textile waste related to disposed clothes incorporates a complex mixture of materials, which delays the decomposition process and therefore leads to an increase of the landfilled resources. Moreover, these resources are exposed to people and assume a relevant public health concern related to the propagation of diseases [10,11]. On the other hand, the textile industry requires high quantities of energy and water, which leads to a relevant emission of greenhouse gases and water contamination [12]. As a result, the textile industry sector must be addressed by the government and policymakers, considering the significant negative impact on public health and environmental pollution.

Furthermore, the global population is projected to reach 9.8 billion in 2050 and 11.2 billion in 2100, which will result in an increase of resources and consequently, to a relevant increase in textile waste [13]. The global industry related to clothing is evaluated in 3 trillion US dollars and employs 300 million individuals [14]. Therefore, the textile industry requires research on optimized technologies and methods to develop strategies to decrease the negative impact on public health and the environment.

The circular economy is an economic system that expands the lifetime of products by promoting the reusing, recycling, and recovering of these products. The circular economy aims to improve sustainable development and environmental quality [15]. Ellen MacArthur Foundation proposes a circular economy perspective to address several challenges such as to decrease the emission and production of dangerous substances and microfibers; to change the methods used on the design and manufacture of clothes to reduce textile waste, and increase the recycling of clothes and to promote the effective use of clothes [16]. Circular economy implementation requires emerging research initiatives at different domains, such as social, technological, and commercial. The acceptance and implementation of novel business approaches related to the circular economy are increasing as long as the research initiatives conducted on both academic and government domains [17,18].

In particular, information and communication technologies (ICT) are needed to increase the visibility and attention on this relevant topic. Furthermore, new ICT methods and systems must be used to develop policies that promote the responsibility of individuals about their significant role in sustainable development [19].

Mobile phones are used by most people during their daily routine and become an indispensable device regarding the numerous applications for several fields. The importance and impact of mobile devices in people's lives are so significant that studies report that most people cannot spend a singled day without their mobile phones [20]. The mobile devices incorporate several connectivity methods for short-range communications such as Near Field Communication (NFC), Bluetooth Low Energy (BLE) and Wi-Fi, but also support long-range technologies, such as GPRS, UMTS, and 3G/4G [21]. These communication methods enable a significant variety of applications in the e-commerce domain [22].

On the one hand, the development of mobile and web applications can promote the applicability of the circular economy concept, which will lead to several advantages in the sustainable management of world resources. On the other hand, a practical study must be conducted in order to synthesize the existing body of knowledge and to identify common threads and gaps that would open up new challenging and significant research directions on the circular economy applications through mobile computing technologies.

The main contribution of this paper is to propose a review of these mobile applications to identify the ones that have characteristics which support circular economy activities. Moreover, it extends the search from major brand online stores to solutions that will enable a designer to produce clothes and put them into the market. Finally, this paper reviewed the Web platforms available in scientific research, where the features found are similar to the parts of the mobile applications. This study aims to review the existent methods for the use of mobile devices and Web technologies for the creation of a system to re-use and re-design the clothes performed by the Fashion Design students from the *Universidade da Beira Interior*, Covilhã, Portugal. In addition, other actions are taken as well as the creation of a Look-Book and a museum to show the different works.

The motivation of the research is to review the existing mobile applications systematically and some Web platforms available in scientific research studies, focused on e-commerce and circular economy of clothes and clothing accessories, as a way to identify their most relevant features. The conclusions of this research will help the development of a mobile application and a Web platform that should integrate the possibility of the user to see all the clothes available for loan/purchase. Also, the user can create favourite albums and compile a look-book with designs. However, there may be other extra features that lead to better mobile application performance and Web platform for all the users. This review is focused mainly on the Portuguese market, although there are already some reviews from other countries [23]. This study is included in several academic projects for obtaining different grades, included two bachelor degrees in Computer Science and Engineering and one doctoral degree in Textile [24] at *Universidade da Beira Interior*, Covilhã, Portugal.

In this study, the authors only consider the applications and platforms which their main target is the circular economy. There are several and high accessed Web platforms such as eBay and Amazon, which support circular economy features; however, that applications are not considering since their core business is the commercialisation of new products from multiple sources. The study of all these mobile applications and Web platforms also allowed to develop a taxonomy that shows the distribution of these apps and Web platforms by the main characteristics of the circular economy. During the development of this taxonomy, first were gathered all the mobile apps and Web platforms related to the circular economy. We evaluated all the constraints defined in this study for each mobile application and Web platform analysed. Putting it all together, we propose the taxonomies desired to the review. This review also contains the pre-existing methods in the literature related to the circular economy associated with sustainable design and production of clothes. The techniques presented in this paper are associated with the circular economy or sustainable design/production of garments [25].

The organisation of the remaining sections of the paper are: Section 2 contains detailed information on relevant topics used in the research of mobile applications and Web platforms. Section 3 presents the results and goals of each mobile app and Web platform. Finally, Section 4 presents the results and discussion on the appreciation of mobile applications and Web platforms and Section 5 concludes the paper.

## 2. Methodology

This study intends to research the existent systems related to the mobile and Web systems for circular economy of clothes as presented in the Figure 2. Particularly, this section defined the search keywords used for the research on the different databases (Section 2.3). After the search in the different databases, the extraction of the different characteristics was performed (Section 2.4).

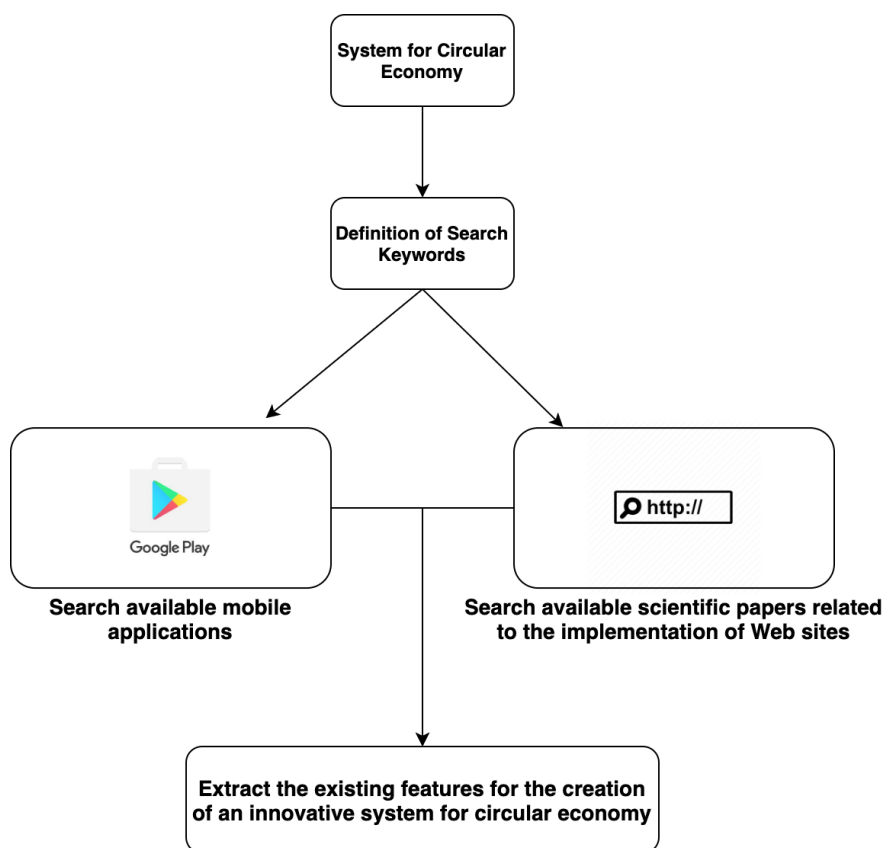


Figure 2. Proposed research.

### 2.1. Research Questions

The relevant questions for this review are: (RQ1) Which are the available mobile applications for purposes of clothes e-trading or e-commerce? (RQ2) From there, which are the mobile applications included in scientific studies? (RQ3) What are the most important features for this type for mobile applications? (RQ4) How can be proposed the taxonomy for the mobile applications of this purpose? (RQ5) Which are the main features available in web platforms for circular economy of clothes?

### 2.2. Inclusion Criteria

This section includes the definition of the inclusion criteria for the research on the mobile applications available on Google Play Store (Section 2.2.1), and the scientific research related to the development of a Web platform (Section 2.2.2).

### 2.2.1. Inclusion Criteria for the Research on Mobile Applications Related to Circular Economy of Clothes

The authors have searched about the mobile applications related to trading activity and circular economy according to the following criteria: (1) the availability of a component of trading clothes, circular economy activity component; (2) the download and registration are free; (3) the existence of updates between 2017 and 2019; (4) the availability in English; and (5) the availability on Google Play Store.

### 2.2.2. Inclusion Criteria for the Research on Scientific Articles Related to the Development of a Web Platform for Circular Economy of Clothes

We selected the scientific papers for the research on the creation of a Web platform fulfils the following criteria: (1) successful circular economy studies; (2) successful e-commerce studies related to the circular economy; (3) use of circular economy in the trade of clothes; (4) published between 2011 and 2019; (5) wrote in English; and (6) innovative studies in circular economy.

## 2.3. Search Strategy

This section includes the definition of the search strategy for the research on the mobile applications related to circular economy available on Google Play Store (Section 2.3.1), and the scientific research related to the development of a Web platform (Section 2.3.2).

### 2.3.1. Search Strategy for the Research on Mobile Applications Related to Circular Economy of Clothes

The search of the mobile application consisted of the following combination of keywords: "Clothes", "Circular Economy", "Exchange" and "Textile". The search took into account the inclusion and exclusion criteria. These were analysed to identify the characteristics of each and their suitability in promoting trading clothes through mobile applications. The application of the keywords was performed in the Google Play Store.

### 2.3.2. Search Strategy for the Research on Scientific Articles Related to the Development of a Web Platform for Circular Economy of Clothes

The search of the scientific studies for the creation of a Web Platform consisted of the following combination of keywords: "Circular Economy", "Clothes" and "Website". The search took into account the inclusion and exclusion criteria. These were analysed to identify the characteristics of each and their suitability in promoting trading clothes through mobile applications. The application of the keywords was done in IEEE Xplore, ACM and Springer for scientific research related to the development of a Web Platform.

## 2.4. Extraction of Study Characteristics

This section includes the definition of the extracted study characteristics for the research on the mobile applications available on Google Play Store (Section 2.4.1), and the scientific research related to the development of a Web platform (Section 2.4.2).

### 2.4.1. Extraction of Study Characteristics for the Research on Mobile Applications Related to Circular Economy of Clothes

The following information was extracted from the mobile applications (see Table 1): name, description, user ranking, number of downloads, author and year of the last update. Analysed mobile applications have the same characteristics. These mobile applications included the possibility of trading, putting on sale and show a portfolio of their clothes.

**Table 1.** List of mobile applications analysed.

Name	Description	User Ranking	Number of Downloads	Author	Year
<i>Textile Deal</i> [26]	Application for buying wedding Designer sarees, half silk sarees, salwar suit anarkali dress, lehengas choli, tunics, unstitched suit fabrics, fashionable kurtis.	4	5000	TextileDeal.in	2019
<i>Textile Export &amp; Wholesaler</i> [27]	Buy designer lehenga or traditional lehenga/sarees in wholesale at cheap price in Surat or across the globe at Textile Export.	3.6	10,000	Textile export	2019
<i>Textile Duniya</i> [28]	Buy clothes in wholesale at cheap price and create your own portfolio of clothes	4.4	10,000	Textile Duniya	2019
<i>Textile Mart Catalog Wholesaler &amp; Exporter</i> [29]	India-based wholesaler and exporter of high quality textile collection	3.6	10,000	Textile Villa Private Limited	2019
<i>Fabric Butler</i> [30]	Create your own clothes with the fabrics disposable by the Fabric Butler	4.1	1000	DuckMa	2019
<i>TextileCatalog.in</i> [31]	Online e-commerce for all textile products in wholesale and retail.	5	500	CadCam Solution	2018
<i>Art Gallery Fabrics   AGF</i> [32]	Online store and choose your own clothes by browsing trough pictures, projects.	4.1	1000	Art Gallery Fabrics	2018

#### 2.4.2. Extraction of Study Characteristics for the Research on Scientific Articles Related to the Development of a Web Platform for Circular Economy of Clothes

The following information was extracted from the analysis of the scientific studies selected (see Table 2): Year of publication, author and description of the study. There is a lack of detailed information about the Web platforms for Circular Economy of Clothes. However, the few studies analysed are related to relevant mobile platforms for this subject.

**Table 2.** List of studies analysed.

Study	Description	Year
Vadim et al. [33]	The authors analyse the potential of sharing economies, how they can be used to explore different kinds of resources and how entrepreneurial teams deal with the expectations and complexity of different institutions.	2017
Rudrajeet et al. [34]	The author in this paper explores the fashion industry and exposes different ways to change the system in which this industry is built according to the existing model.	2017
Hill et al. [35]	The author explains how the waste policies in the United Kingdom (UK) are taking a more circular turn and the difficulties in turning the concept of circular economy into policies.	2016
Kirstie et al. [36]	The authors explain how circular economy is being enabled by big corporations like HP and how it can become beneficial for the growth of various concepts.	2016

### 3. Results

#### 3.1. Mobile Applications

Our review, as illustrated in Figure 3, identified 96 applications. The applications were evaluated in terms of price, target audience, update date, user assessment and downloads, resulting in the exclusion of 78 applications after application of the inclusion criteria announced before. The analysis of the remaining 18 applications resulted in the exclusion of 11 mobile application that not meet the defined *criteria*. The remaining seven mobile applications were analysed and included in the qualitative synthesis.

Table 1 shows the description, the user ranking, the user's evaluation, the number of downloads, the author, the year of the last update and its goal. Following the user's assessment, there are 2 mobile applications with 3.6 stars (28.57%), 1 mobile app with 4 stars (14.28%), 2 mobile applications with 4.1 stars (28.57%), 1 mobile applications with 4.4 stars (14.28%) and 1 mobile applications with 5 stars (14.28%). Following the number of downloads, there is one mobile application with at least 500 downloads (14.28%), two that with at least 1.000 downloads (28.57%), 1 with at least 5000 downloads (14.28%) and 3 with at least 10,000 downloads (42.85%). The analysis of these applications in scientific studies is inexistent. The major part of the mobile apps has updated in 2019, that is, five mobile applications (71.42%) and the rest two mobile applications has updated in 2018 (28.57%). Following the goals of the mobile applications selected, "Circular Economy", all the seven mobile applications are inserted in this category. Also, all of the mobile applications analysed in this study that are available in Google Play Store are only focused on trading, and none of them are used for loaning and showing a Look-Book.

*Textile Deal* [26] allows the user to see all the products available in stock at low prices so that people can buy them. It has all types of clothes, and the download is free.

*Textile Export & Wholesaler* [27] this application is similar to the one described above. It allows the user to see products available in stock, all at low prices so that people of any social class can buy them. Almost all of the products exposed are Indian fabricated.

*Textile Duniya* [28] allows people to do an Advanced Search about specific types of clothes, which the user can be interested. It will enable the user to create a Portfolio so that they can define the attributes of the clothes they are selling.

*Textile Mart Catalog Wholesaler & Exporter* [29] has a list of clothes and accessories that are available for buying. The user can specify the type of clothes he wants and specify the fabric they want to include.

*Fabric Butler* [30] is an application for people who appreciate the excellent quality and love made-to-measure shirts. Users can make their shirts, with the material they like. This application allows users also to create the portfolio of their own made clothes.

*TextileCatalog.in* [31] allows the user to see all the products available in stock at low prices so that people can buy them. Most of these clothes are Indian fabricated, and it has all types of clothes and tissues, and the download is free.

*Art Gallery Fabrics—AGF* [32] allows the user to browse through pictures, projects and all of their prints so the user can get inspired and choose the clothes they like the most. It also allows online shopping through a lot of stores nearby. Its download is free.

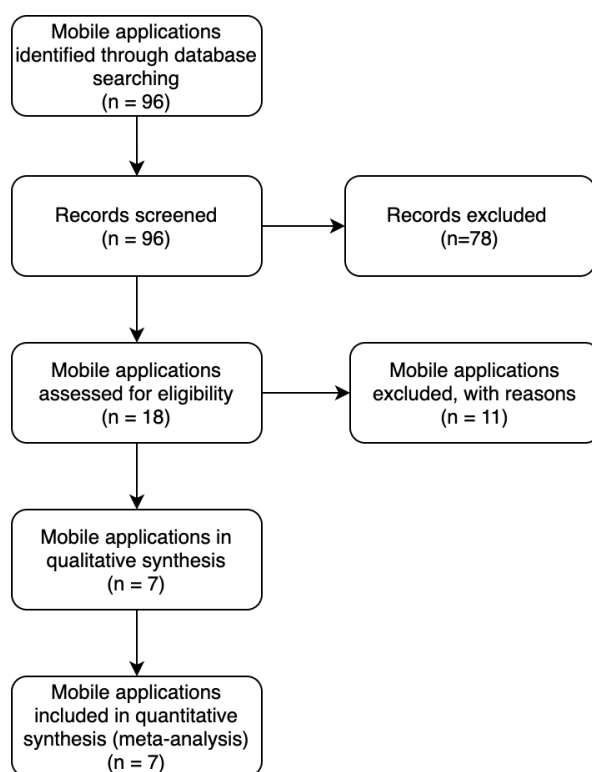


Figure 3. Mobile Applications Analysis.

### 3.2. Web Platform

This review, as shown in Figure 4, identified 119 papers. They were primarily evaluated according to the keywords, abstract and title, resulting in the exclusion of 87 papers. We performed the full-text assessment of the remaining 32 studies, resulting in the inclusion of only 4 papers in the qualitative and quantitative analysis. The papers were excluded according to the subjects and the level of innovation, verifying that the majority of the papers lacks in the innovation concepts.



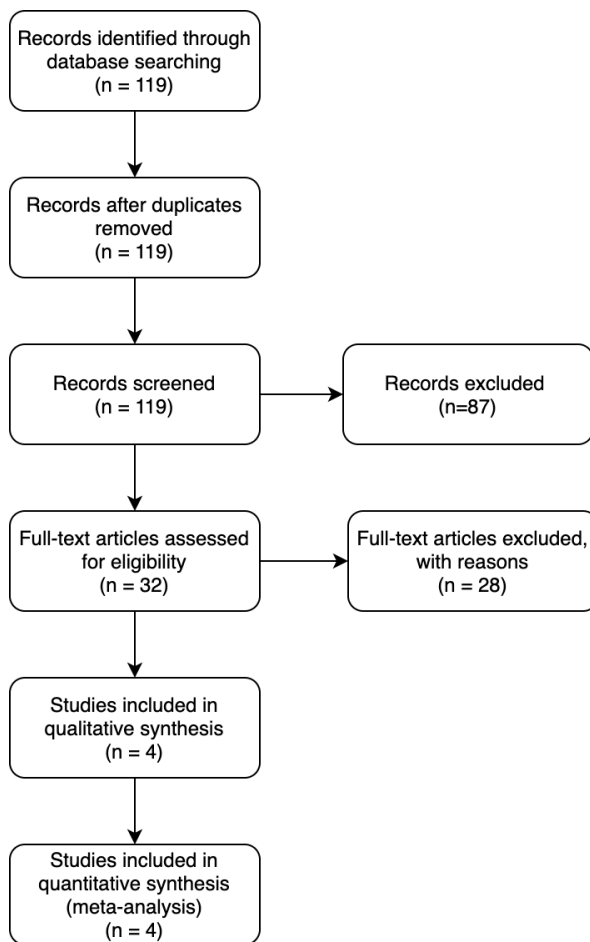


Figure 4. Scientific studies analysed.

Is advised that interested readers should search for the original cited papers to find relevant information and more details about its theories. Table 2 refers to the author, year of publication and a brief description of the analysed paper.

In Reference [33], the authors discuss the green logic and environmental benefits and unknown downsides of a shared economy. The authors mentioned the different schemes used to define a shared-economy and which actors are involved in the said economy, with the most common ones being the Peer-to-Peer (P2P) that occupy  $\frac{3}{4}$  of the defined models. P2P types of economy offer inevitable redundancies, according to the authors, for there is a need to ensure specific usage models and that the quantities of service providers and consumers are balanced. The environmental impact of shared economies seem green at first glance but may have ecological effects more harmful than the regular economy. A shared-economy may prevent the growth of a pollutant business but maybe feeding a different pollutant business, for consumers can and will save money when using a shared economy. However, they may spend that money on buying other things.

As Reference [34] can show, the negative environmental impact associated with the clothing industry is a concerning fact, and most industries are trying to change their ways to embrace the ecological design. It consists of designing according to the available resources and having the final thought of producing just enough to meet the market needs. The author also mentions different archetypes to remodel and innovate the commerce of clothing, being the most pertinent for this paper the creation of value-form “waste”. In the model mentioned, the author says how circular economy is an ally in the remodels of the industry for it allows “close the loop”, being the loop: circular supplies, resource recovery, product life extension, sharing platforms and product as a service.

Hill [35] focuses more on the circular economy and how it can change the production and the expenses of the waste produced in the European Union (EU), most specifically in the UK. The EU has policies about the implementations of circular economies and which type of wastes are prioritised to enter in this type of economy. According to the author, the UK has been successful in the implementation of the EU’s policies. However, it is a slow process developed in 30 decades.

In Reference [36], the authors describe the circular economy and how it helps to create brand loyalty in the technological department, their business further and a new type of companies befitting of the company.

#### 4. Discussion

Following the results, Figure 5 shows a taxonomy for all the mobile applications analysed in this study. It consists of three categories, such as “Trading”, “Loan”, and “Look Book”. Most mobile applications related to online shopping and circular economy, among others. In Figure 5, it is possible to observe the characteristics of each category. Table 3 complements Figure 5, distributing the mobile applications to each category of the taxonomy proposed.

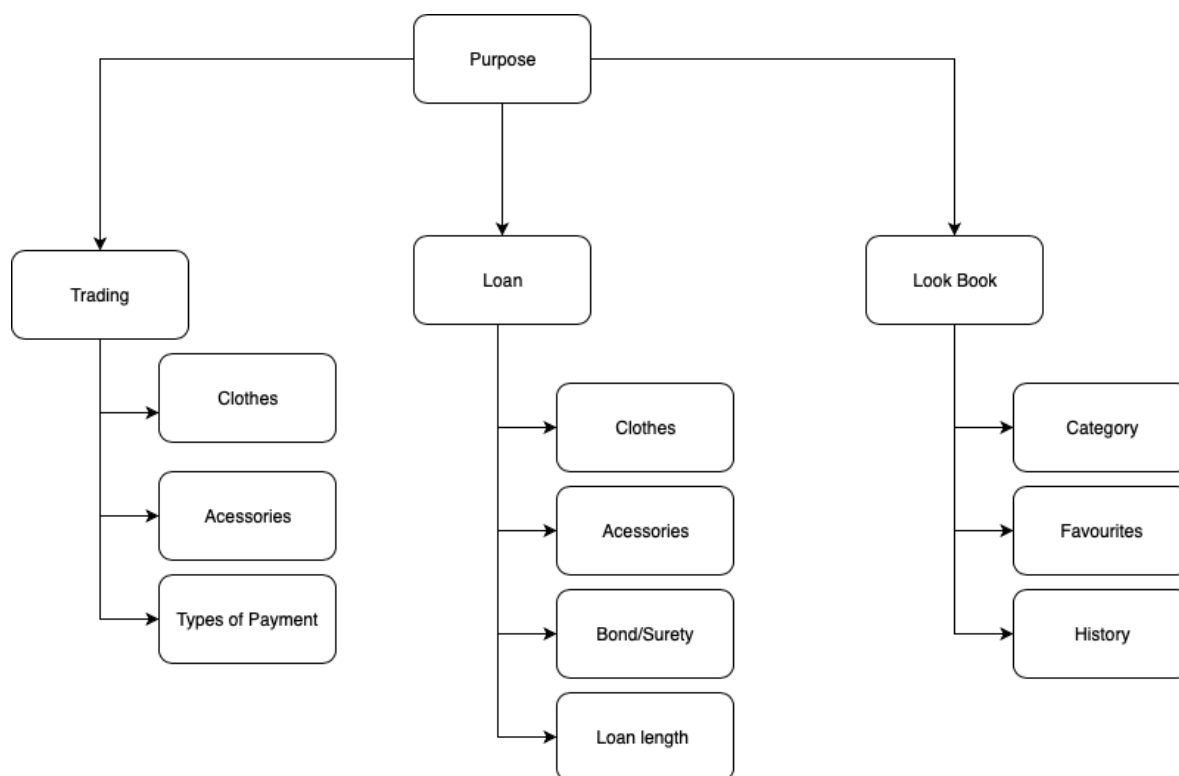


Figure 5. Taxonomy for the Mobile Applications and Web Platforms Analysed.

Table 3. Distribution of Mobile Application by Categories of Features.

Categories:	Mobile Applications:
Trading	Textile Deal [26], Textile Export & Wholesaler [27], Textile Duniya [28], Textile Mart Catalog Wholesaler & Exporter [29], Fabric Butler [30], TextileCatalog.in [31], Art Gallery Fabrics — AGF [32]
Loan	Textile Deal [26], Textile Export & Wholesaler [27], Textile Mart Catalog Wholesaler & Exporter [29], TextileCatalog.in [31], Art Gallery Fabrics — AGF [32]
Look Book	Textile Duniya [28], Fabric Butler [30]

The category “Trading” includes the functionalities related to the selling of clothes and accessories, proposing different types of payment. Next, the category “Loan” includes the functionalities related to the loaning of clothes and accessories, including the payment of a surety bond, and the definition of a loan length. Finally, to sell and loan the different clothes, the presentation of the available clothes and accessories is needed. Thus, in the model of circular economy of clothes is needed the creation of a Look Book to present the different clothes and accessories for loaning and trading of used clothes. The Look Book is created with the used clothes available from different people, where without publicity and show the available clothes and accessories is impossible to have a successful circular economy model.

Trading of clothes potentiates the re-use of some materials considered as waste [37]. However, some barriers related to the import and export of these materials between countries should be avoided [37]. It will have benefits in the environmental consequences related to the waste producing by the clothes manufacturers [37]. At the same point, the loaning of the clothes also benefits in the reducing of the waste with the production of new clothes. The textile industry causes a lot of pollution that can be reduced with the re-use and re-design of old clothes. All the mobile applications analysed in this study are for trading commerce. In these mobile applications, the users can see all the types of clothes and accessories available for trading or even possible for a loan. After a quick look at all the dresses available, the user then can decide if they want to buy those clothes or ask for a loan. Some mobile applications have specific functionality, which is to create a portfolio. In this functionality, the users may create a book where they can save the clothes they liked the most, the accessories they enjoyed the most, among others. The users can search after separate these clothes and accessories through a category, so that the search of a specific item may be more accessible. For instance, if a user wants to do a search related to “winter clothes”, he will need to click on this category. The Look Book features are essential supporting the circular economy since they not only help the user to compare the environmental features of each product but also can provide the details about the environmental impact of the producer. Furthermore, most of the mobile applications have the possibility of a loan. In these mobile applications, it gives a specific time for the user to use those clothes/accessories in the change of a bond/surety. After the period is expired, the user can extend the loan or return the clothes. On the one hand, by loan clothes, people are extending the life cycling of clothes. Several people buy clothes to use them only one time in a particular event and store them in a closet. This approach is a consumerist procedure that leads to the creation and accumulation of waste resources. On the other hand, by selling used clothes, we avoid the production of new clothes that are associated with the evolution of landfilled tons of textiles produced every year. In sum, the trading activities related to the circular economy will contribute to a better and more ecological world, which will bring relevant outcomes for everyone. These type of applications are beneficial because people can buy clothes, view the entire catalogue of a store without going to those same stores. Sometimes shopping online in these applications may give opportunity discounts to specific items. Nowadays, it is a growing business.

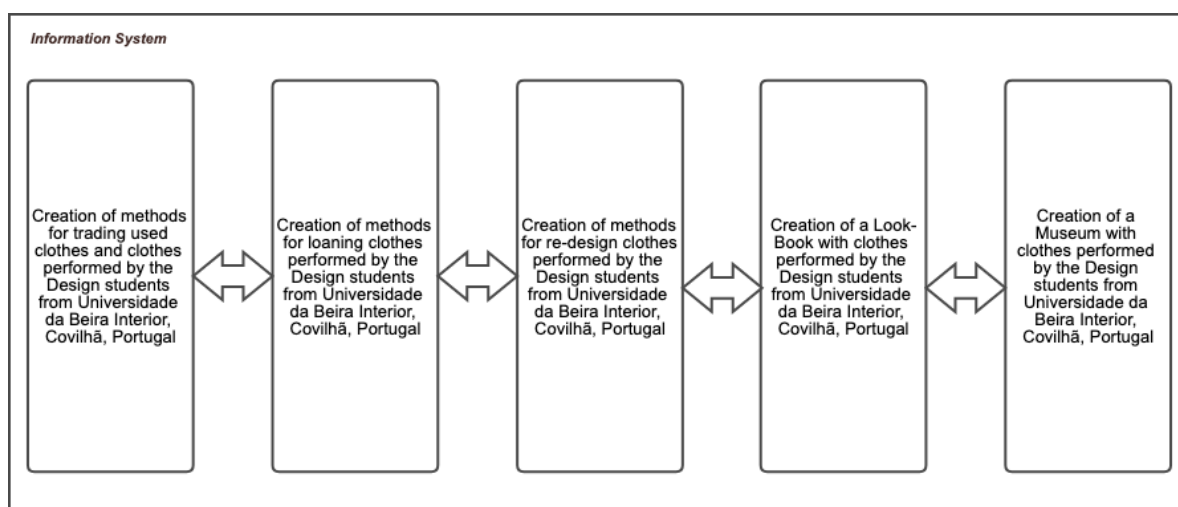
All the applications analysed have the possibility of different types of payments. These payments can be made online or by order, and then the payment is made when it arrives at the destination, trough cash. The user also can view the catalogue and then head for the closest store to buy the items he saw online.

However, the research of the information about mobile platforms for circular economy of clothes is very limited because there are no results found in IEEE Xplore and ACM. Mainly, this subject uses the technology, but it is not mainly technological and it is related to textile industry. However, the studies found in Springer are not directly related because this subject is very recent in textile industry [38].

Mobile applications are becoming more relevant to people’s daily routine since the majority of the population has mobile devices. Nowadays, mobile devices incorporate a lot of wireless communication technologies for long-range such as 4G, 3G and GSM and short-range such as Bluetooth, NFC and Wi-Fi [39]. Moreover, these devices now have high computational resources and a high number of applications for multiple domains [40]. People commonly have mobile devices and use them for

multiple applications such as social media, social networks and consult e-mail [41]. Therefore, mobile applications can be an efficient and practical approach to promote circular economy. The design and development of a mobile application that supports the most relevant features of the circular economy can stimulate circular economy activities since people can check the used clothes available for trading in real-time. Using a mobile application, people have access to circular economy activities in their pocket anywhere and anytime.

The main idea of this paper consists in the review of the existent electronic techniques to loan and trade clothes performed by students to exploits the diffusion of the works performed by Design students from *Universidade da Beira Interior*, Covilhã, Portugal. Figure 6 shows the possibility for creation of an information system to show the works performed by these students [42]. Moreover, the authors aim to create a system to mainly help in the re-use and re-design of the clothes performed by Fashion Design students, performing the trade and loan of the created clothes as well as its exposition in a museum and a look-book to show the different clothes to the community.



**Figure 6.** Design of a system for Sustainability design for students from Universidade da Beira Interior, Covilhã, Portugal.

This study is related to the various mobile applications and Web platforms existing in the area of retail, circular economy and trading. This paper results in a brief description of mobile apps and Web platforms, in which one of the main objectives is the possibility of ask for a loan/purchase of clothes to the user based on a paradigm of the circular economy [43,44]. Furthermore, this review exposes the concept of circular economy and everything associated with it, from its environmental ups and downs. It can also help businesses to bloom and adapt to a new era as well as raising customer fidelity. Another concept this review approaches is the environmental impact of the clothing industry and the growing need to change its concept and explore ways that enable that change.

## 5. Conclusions

This review identified and described a set of mobile applications and scientific papers that are used and developed to this type of economic activity, followed by a series of questions that were respected. Seven mobile applications examined and four scientific papers examined, and the main findings are:

- (RQ1) *What are the available mobile applications for purposes of clothes e-trading or e-commerce?*  
For this first question, there were a lot of applications whose main goal was the e-commerce or e-trading. Not all of them had the main activity we are searching, which is the circular economy.
- (RQ2) *From these, which are the mobile applications included in scientific studies?*  
From these applications we studied, none had been involved or endorsed by any scientific studies.

- (RQ3) *What are the essential features for this type for mobile applications?*  
The crucial features for this type of mobile apps are the possibility of the user to trade clothes/accessories with other users and create their portfolio of items created or owned by themselves.
- (RQ4) *How can be proposed the taxonomy for the mobile applications of this purpose?*  
The taxonomy was suggested by three different characteristics, such as trading, loan and look-book. Firstly, the trading included clothes, accessories and various types of payment. Secondly, the loan provides for also clothes and accessories, bond/surety and a loan length. Finally, the look-book should have a category, favourite type and a history search.
- (RQ5) *Which are the main features available in web platforms for circular economy of clothes?*  
These platforms are mainly used to sell, buy or loan clothes based on circular economy purposes. There are other platforms used for selling, like eBay, AliExpress and Amazon, but these platforms are not used for circular economy. By the end, the platforms used are similar to these platforms, but it promoted the buy and selling between users in order to give a new life for the clothes.

This paper served the purpose of exposing two different concepts and allying them to create a sustainable platform that enables the growth of inter-personal relationships and environmental care. The growing concern for the environment makes people look for different alternatives and become excited when they can take part in innovative business. The circular economy in a P2P scheme with the remodel of the clothing industry grows possible and desiring to exchange and loaning different pieces of clothing or accessories, giving these pieces a new life and purpose.

The use of technologies that operate on a mobile devices level enables the construction of a Web platform. The main target of this type of platforms is the millennial and this generation has a significant dependency on mobile devices that allows the exploration of new approaches to old problems.

Due to the easiness to buy clothes without going to malls and stores, mobile applications and Web platforms related to the circular economy and online shop are growing incredibly. This type of commerce also allows people to reduce the environmental impact because they can put their clothes on sale and propose in exchange for other pieces. Nevertheless, the circular economy of clothes has currently some limitations [45] such as social and environmental factors that are not considered in the prices, circular economy models are difficult to develop, investments are required, circular economy products and alternatives have low demand and there are only a small number of professionals that has technical and technological knowledge to develop these models.

As future work, it is intended to create a system for the Design students from the *Universidade da Beira Interior*, Covilhã, Portugal, composed by loan and trading of the clothes created by the students, including the creation of a Look-Book to show the works over the world. As the creation of clothing fabrics is very polluting, we must preserve the environment and reuse clothes.

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