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Qualitative analysis on the driving force behind upcycling practices associated with mobile applications: Circular economy perspective

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Abstract
Upcycling is a type of practice included within the circular economy. Although interest in this type of activity has grown in recent years, academic analysis of the drivers that impel these activities is poorly developed. This work focuses on upcycling activities developed in the context of rural tourism. Through field work based on structured interviews applied in the region of Andalusia (Spain), evidence was sought about the drivers that promote this type of practice. In particular, attention was paid to the role of mobile applications as facilitators of upcycling. The main finding was that technology helps in using upcycling practices when considering rural tourism, as demonstrated by the use of mobile applications and websites such as Wallapop. There was also evidence of the different factors that drive the development of upcycling practices: the existence of a traditional social network as a means of obtaining second-hand items, technology as an element that facilitates access to items owned by strangers, the need to offer the image sought by tourists, and a desire to maintain the cultural essence of the region.

Keywords Upcycling · Circular economy · Rural tourism · Mobile applications · Peer-to-peer platforms · Qualitative analysis

1 Introduction

In a context in which society is becoming more aware of the importance of social and environmental sustainability (Pazhuhan and Shiri 2020), several factors drive the change in production and consumption dynamics in numerous economic activities (Agrawal et al. 2021; Tipu 2021). It is widely assumed that the sequence that *takes, makes, and discards* is becoming less sustainable (Razminiene 2019). Among these factors of change, social pressure stands out, which warns of the unsustainability of the traditional consumption model (Pacheco et al. 2010). Also contributing to the alteration of the model is the fact that waste management is a growing concern in industrialized countries (Zaman 2016), the widespread rejection of planned obsolescence (Sung 2017), and awareness on the part of consumers regarding sustainable consumption (Jaeger-Erben et al. 2015). Focusing on the sector analyzed in this work, tourism; it is clear that tourists increasingly include factors related to intangible values in the destination selection process, together with the symbiotic relationship with the region and to how travel affects

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the destinations (Canavan 2018; Poelina and Nordensvard 2018).

The great challenges linked to global warming, social inequalities and the damage caused to ecosystems require changes in the way of consuming, producing, and even in legislation (Bell et al. 2019; Calvo et al. 2020). One of the strategies linked to these changes comes from practices that seek to extend the useful life of products and reduce waste generation (Charter and Keiller 2014). In this context, the concept of upcycling was born as part of the circular economy, which is defined as the "reuse of discarded objects or materials in such a way that a product of higher quality or value than the original is created" (Oxford Dictionary 2019). This activity involves the reuse of objects that are given a different function from the original (Wilson 2016). Therefore, unlike other practices, lower-value raw materials are not generated, and energy, materials, and water consumption is lower (Wilson 2016). However, the theoretical framework related to these activities is still underdeveloped (Anderson et al. 2018) as is empirical research (Bhatt et al. 2019). The latter is the research gap to which this work offers a contribution, which will be specified later. The case studies carried out to date have mainly focused on the field of production technology, engineering, and design (Bhatt et al. 2019). Within the literature on upcycling, a line of great interest is the one that focuses on the analysis of the drivers that promote the extension of these practices, which is the one assumed by this research.

As noted, this research focuses on the tourism sector. The role that this activity has in economic growth and development is beyond doubt (De Castro et al. 2019; Salinas et al. 2022). Many regions and countries have made tourism the axis of their strategy of productive reconversion and diversification of activities (Guaita et al. 2019, 2020). In particular, rural tourism has grown notably in recent decades, revitalizing regions with weak productive structures (Martín and Guaita 2019) and areas in which agricultural production has declined (Aguilera et al. 2014). In the academic world, increasing attention is been paid to the study of this type of tourism. Numerous works have been based on case studies focused on specific regions (Gao et al. 2009), partly as a consequence of the great heterogeneity that characterizes rural tourism. Research on this activity considers two main lines of work, the analysis of the potential of tourism to promote rural development and the study of its sustainability (Sharpley and Roberts 2004). This work focuses on the second line of research, as will be explained below.

One of the contributions of this work focuses on the study of the role of technology (mobile APP and websites) as a facilitator of upcycling activities. This is possible insofar as online commerce has grown and specific applications have been developed for the exchange of used products between individuals (Shuib et al. 2015; Fernandes et al. 2018). These applications, some of them focused on specific product categories such as clothing, facilitate the development of circular economy practices (Prieto-Sandoval et al. 2018; Homrich et al. 2018; James and Lings 2018). Therefore, this type of technology can be used to develop policies that promote people's responsibility in sustainable development (Geissdoerfer et al. 2017).

Specifically, applications for cell phones can contribute to enhancing the dynamics of exchanging used goods. Cell phones are used by most people during their daily routine and have become an indispensable device (Faria et al. 2020). Mobile devices incorporate various connectivity methods for short-range communications, such as Near Field Communication (NFC), Bluetooth Low Energy (BLE), and Wi-Fi, but they also support long-range technologies, such as GPRS, UMTS, and 3G / 4G / 5G (Marques et al. 2019). These technologies facilitate a significant variety of applications in the domain of electronic commerce and product exchange, based on the geolocation of nearby users (Agrebi and Jallais 2015). The development of mobile and web applications can promote the applicability of the circular economy concept, which leads to several advantages in the sustainable management of global resources (Faria et al. 2020). Therefore, mobile applications can be an efficient and practical instrument to promote the circular economy. Through a mobile application, people have access to the exchange of products owned by people outside their social network, which promotes the circular economy in a simple way, anywhere and at any time (Faria et al. 2020). Although the role of ICT in the transition to a circular economy model is fundamental, the academic literature is still very limited. In this sense, the transition to a more sustainable consumption model can be benefited by multidisciplinary research in upcycling and technology (Demestichas and Daskalakis 2020).

This study proposes an analysis of an exploratory nature since generally accepted theoretical frameworks have not been developed for the subject under analysis. The empirical evidence that this work contributes will contribute to the development of a specific theoretical body. This research focuses on analyzing the drivers that impel upcycling practices in rural tourism, specifically studying the role of mobile applications that facilitate the exchange of second-hand objects. In this work, the term 'upcycling' is used as a broad concept that encompasses all materials or objects that are unused and are salvaged to give them added value. It is understood that, otherwise, they would end up in the garbage or in a recycling bin. This proposal makes relevant contributions to the drivers of upcycling practices by entrepreneurs. In addition, it contributes to expanding the literature on the sustainability of rural tourism and its role in

conserving the cultural heritage of the environment. The latter is of special interest, given that tourism has traditionally been blamed for standardizing environments and damaging the features of the traditional culture of destinations (Martín et al. 2020: Guaita et al. 2021). This proposal is justified by verifying that the increase in connectivity brought about by the internet has favored the processes of co-creation and cooperation between consumers (Labrecque et al. 2013; Yuksel et al. 2016).

The objective of this work is to make a contribution to the research gap detected in the academic literature on the drivers that promote upcycling practices. Connected to the above, it also seeks to analyze the role of technology as a driver of upcycling in rural areas. Therefore, an empirical contribution will be made to the detected research gap, so that action policies focused on promoting these practices can be defined. The academic contributions to this gap are of great importance, as they will increase information on the factors that can help promote upcycling, especially with the help of technology. In the context of rural areas, characterized by a greater dispersion of the population, the connection via mobile technology can generate a great boost that reinforces traditional social networks. The concrete contribution of this work is based on the following research questions. RQ1: Does technology facilitate the development of upcycling in the context of rural tourism? RQ2: What are the factors that drive upcycling in this context? RQ3: Does upcycling contribute to preserving traditional and cultural elements? The study is based on fieldwork carried out in September 2021 in the Spanish region of Andalusia, an area with a great tradition in rural tourism. Following the usual practice in studies on rural tourism, a homogeneous region was taken as a reference, in which 25 in-depth interviews were carried out with rural accommodation owners. The derived information was transcribed and processed using the qualitative analysis software NVIVO.

2 Literature review

2.1 The importance of the circular economy in sustainable tourism

The circular economy, a set of practices including upcycling, consists of actions that permit the life of products to be extended through recovering, reusing and recycling the products (Faria et al. 2020). Therefore, the circular economy seeks to promote a more sustainable development / consumption model and thereby preserve the environment (Kirchherr et al. 2017). The implementation of a production and consumption model based on the principles of the circular economy implies taking into account aspects related to the design of the production process, the materials used, the way to reduce the waste generated, etc. (Stahel 2016). This transition requires research initiatives focused on different domains, such as the social, technological and commercial (Faria et al. 2020). Even though the acceptance and implementation of novel business approaches related to the circular economy is increasing, greater governmental support and further development of academic research are required (de Mattos and Albuquerque 2018). Close cooperation within and between different sectors of society, encompassing governments, academics, non-governmental organizations, businesses and the general public, is of vital importance to support and implement the principles of the circular economy (Sukhdev et al. 2018).

Tourism can exert great pressure on the destinations in which it is developed, many of them very environmentally sensitive and subject to a large seasonal concentration of visitors (Martín and Guaita 2019). The tourism industry requires new business models capable of promoting the circular economy and thereby guaranteeing environmental conservation. This new orientation can generate cost savings while increasing income and employment in local communities (Zorpas et al. 2021). Academics argue that the circular economy encourages the reduction of resource use, limits the amount of waste production and carries the potential for economic prosperity (Zink and Geyer 2017), making it a very useful practice to minimize the impact of tourist activity. Although these practices have increased their implantation among some of the stakeholders involved, there is not much published data on the transition to upcycling practices (Zorpas et al. 2021).

The circular economy has important drivers such as “government support”, “business culture”, “consumer demand”, “social recognition”, “economic attractiveness” and “information for professionals” (Gue et al. 2020). However, the transition from a linear economy to a circular economy is not an easy process for companies. Rather, companies must face and overcome a wide range of barriers and challenges in their transition processes. Barriers to the circular economy can be grouped as “outsourcing barriers”, “financial barriers”, “technological barriers”, “knowledge barriers”, “government-related barriers”, “participation and support barriers”, “economic barriers”, “technological barriers”, " barriers related to knowledge and skills", " barriers related to management”, “barriers related to the circular economy framework”, “cultural and social barriers” and “barriers related to the market“(Govindan and Hasanagic 2018; Govindan et al. 2014).

Specifically, the tourism industry faces difficulties in this transition process like other industries. Strategies must be identified to overcome obstacles and take advantage of the potential gains associated with the circular economy

(Vargas-Sanchez 2018). Tourism, in many destinations, is considered a fast-growing activity; it is associated with an intensive consumption of resources and a high generation of waste (Pamfilie et al. 2018). While tourism creates value and helps countries develop their economies, traditional development models can damage the environment and produce large amounts of waste and pollution (Girard and Nocca 2017). Therefore, in this industry, the development of new processes based on the circular economy, which reduce the use of resources and create value from waste, acquires special relevance (Pan et al. 2018).

2.2 Drivers in upcycling practices

Taking a product-focused perspective, upcycling involves a modification of goods at the business or individual level (Sung et al. 2014). Its main advantage is reducing waste, reducing the energy used in manufacturing, and the possibility of avoiding new consumption (Sung 2017; Wilson 2016). Through these practices, consumers fix broken products and salvage them for a new use (Charter and Keiller 2014). The literature on the factors that drive upcycling practices is still fragmented and underdeveloped (Paras and Curteza 2018), unlike studies referring to the drivers that drive sustainable behavior among consumers (Sung 2017). The analysis of the literature generated to date starts from its classification into three blocks: driving factors that affect consumers, factors that affect traditional companies, and factors that affect entrepreneurs focused on the sustainable economy. The last two cases are little studied, so by approximation, we have resorted to studies that analyze the drivers associated with circular economy practices. This paucity of studies focused on upcycling drivers further justifies this work. Regulations can be considered a driving force behind upcycling practices. Little by little, regulatory frameworks have been developed that help to promote this type of activity. Such would be the case of the EU Directive 2018/851, the 2030 Agenda, and the Sustainable Development Goals (SDGs), which give a greater role to the green economy (Jayasinghe et al. 2021; Rodic et al. 2017). These legislative frameworks reflect the fact that growth will not be sustainable if it does not include environmental and social considerations (Jayasinghe et al. 2021). In addition, this political support is also associated with the great potential of circular economy activities in terms of job creation, generation of economic growth, and creation of competitive advantages (Bocken et al. 2014; Lieder and Rashid 2016).

Citizens often perform upcycling practices based on motivations such as environmental concerns (Sung et al. 2014; Wilson 2016), saving money (Nalewajek and Macik 2013; Sung et al. 2014), the relaxation and personal satisfaction that is associated with the process (Wilson 2016; Sung et al. 2014) and even motivated by the aesthetic and singular value of the creations (Wilson 2016; Tian et al. 2001). Consumers are motivated to turn waste into useful items in economically disadvantaged environments, considering the scarcity of economic resources (Prahalad 2006). The value of upcycling as a means to preserve cultural and traditional elements has not been studied, this being an additional contribution of this work. Many traditional industries have begun to incorporate upcycling practices as well, at least partially. The extension of this type of business practice makes it necessary to identify the drivers that drive the transition, something that has been little studied in the academic literature (Jesus and Mendonça 2018). There is no theoretical framework that describes the way in which companies adopt circular economy models in their existing model (Urbinati et al. 2017). Although research in this regard is scant, some drivers have been detected. Traditionally these practices have been associated with sustainable engineering and design approaches (Janigo and Wu 2015; Todeschini et al. 2017). This practice is also associated with processes of reverse engineering, tuning, and social activism (Busch 2008). It seems that one of the most important driving factors is associated with an improvement in the company's social image (Urbinati et al. 2017). The increase in production costs and the need to reduce inputs seem to be behind some processes of change towards circular economy models (Jesus and Mendonça 2018; Korhonen et al. 2018). Even though there are some studies, several authors have pointed out the importance of increasing research on the adoption of circular economy processes in companies (Murray et al. 2017; Jesus and Mendonça 2018; Rizos et al. 2016).

Within the circular economy framework, some drivers have been described that affect upcycling activities by extension. This is the case of legislation and political support, the growing social awareness of these production models, social recognition, improvements in the environmental culture of companies, the extension of communication technologies, and the expansion of business models based on collaborative activities (Lieder and Rashid 2016; Rizos et al. 2016; Levänen 2015), among others. Therefore, the driving factors could be divided into the following categories: (i) technical, (ii) economic and financial, (iii) institutional and regulatory, (iv) social and (v) cultural (Jesús and Mendonça 2018). As this work shows, technological development also acts by promoting circular economy practices (Mathews and Tan 2011), as it improves the optimization and reuse of resources (Ghisellini et al. 2016; Jesus and Mendonça 2018). In this sense, online platforms can facilitate the optimization and reuse of resources (Mathews and Tan 2011; Ghisellini et al. 2016; Jesus and Mendonça 2018). Therefore, this work seeks to verify this idea in a particular way for upcycling practices linked to tourist activities.

For traditional companies, implementing circular economy practices can be an extremely challenging task (Husain et al. 2021; de Lima et al. 2021; Goni et al. 2020). Finally, we refer to the factors that can drive entrepreneurship within the framework of upcycling and circular economy activities. In the academic literature, the value of sustainable entrepreneurship has been recognized, since, in addition to promoting social and ecological sustainability, it offers great potential in creating employment and wealth (Cohen and Winn 2007; Shepherd and Patzelt 2011). The main motivations of the entrepreneurs included in the so-called green economy are varied. They are motivated by personal convictions of social improvement (Jayasinghe et al. 2021), of course, considering the financial sustainability of their projects (Wilson and Webster 2018). Innovation is a factor of great importance for this type of entrepreneur (Bymolt et al. 2015; Storey et al. 2015), as they are considered agents of change (Hall et al. 2010; Hockerts and Wüstenhagen 2010). The drivers of companies based on sustainability include their own principles and values related to the change towards sustainable models in their decision-making (Di Vito and Bohnsack 2017). Eco-entrepreneurs seek to plan their company in the most sustainable way possible from an environmental and social point of view (Di Vito and Bohnsack 2017). These types of entrepreneurs are more proactive in the use of more sustainable practices, alternative technologies, recycled materials, waste conservation policies, etc. (Hall et al. 2010; Hockerts and Wüstenhagen 2010).

Considering the review of the literature on upcycling, it is possible to point out the need to provide empirical evidence of the factors that drive upcycling among citizens and entrepreneurs. As well as analyzing the role of technologies as drivers of upcycling in rural settings. This justifies the definition of the three research questions posed. RQ1: Does technology facilitate the development of upcycling in the context of rural tourism? RQ2: What are the factors that drive upcycling in this context? RQ3: Does upcycling contribute to preserving traditional and cultural elements?

2.3 Tourism and preservation of cultural heritage

Rural tourism as a development driver activity offers some very positive advantages. It is a more sustainable activity than other alternatives that could be considered in natural environments (Pérez et al. 2020). In fact, conservationism is understood to be part of it (Doswell 1997). In addition, it acts by diversifying the local economy, can improve rural infrastructures (Puczkó and Rátz 2000), and reduce the isolation of communities (Canoves et al. 2004). Obviously, potentially negative effects have also been described, especially related to the environmental impact due to the arrival of tourists. These effects will be conditioned by the development model, by the annual concentration of tourist flows, and of course, by the volume of arrivals (Martín et al. 2019). A negative aspect associated with tourist activity, not only linked to rural tourism, is damage to local culture and loss of identity (Martín et al. 2020). In this sense, the preservation of traditional values, livelihoods, and physical elements that characterize local communities should be a priority (Martín et al. 2021). Rural tourism is nourished by the environmental and cultural values of the areas in which it is developed. This activity generates clear relationships with citizens, space, and products from the destinations (Nepal 2007; Wang et al. 2016; Xia et al. 2011). Rural areas are repositories of the historical and cultural heritage, so the tourism that takes place in these areas offers a unique experience (Lane 1994). In fact, the initial vision of sustainable tourism focused on ecology and economy has been replaced by a perspective in which social culture has the same importance (Weaver et al. 2020). In this sense, social entrepreneurship can contribute very positively to the promotion of a respectful development model (Méndez-Picazo et al. 2021), capable of integrating the interests of the different groups involved (Sigalat-Signes et al. 2020). This is the development model demanded by today's society (Tiago et al. 2021; Eslami et al. 2019).

The great responsibility that falls on the promoters of tourist activity in rural areas can be deduced from the foregoing. In addition, tourists have rejected the more invasive tourism development models and the excessive generation of waste linked to tourism (Caruana et al. 2014; Gössling et al. 2012). Activities related to upcycling are included within the guidelines identified as responsible by tourists, which is causing the tourism industry to accept them more and more (Sørensen and Hjalager 2020). See Fig. 1. In addition to improving the environmental impact, these practices can contribute to improving the experiences of the visit in a positive way and even its aesthetic component (Prebensen et al. 2017). In this sense, recycling and upcycling activities carried out for decoration and construction purposes can create even healthier environments than those based on artificial materials full of harmful chemicals (Sørensen and Hjalager 2020). The recovery of traditional elements that have been part of the life and economic activities of tourist destinations is on the rise. In fact, the concept of "shabby chic" acquires positive connotations when referring to terms such as "vintage" and "fashion" with regard to the recovery of traditional objects (Sørensen and Hjalager 2020). These articles, which are given a second life, are highly appreciated in photographs shared on social networks (Sørensen and Hjalager 2020). In some cases, the tourists themselves are involved in recycling and creation activities (Liburd and Becken 2017), something that encourages the experience of cultural immersion and can also be transferred to the daily

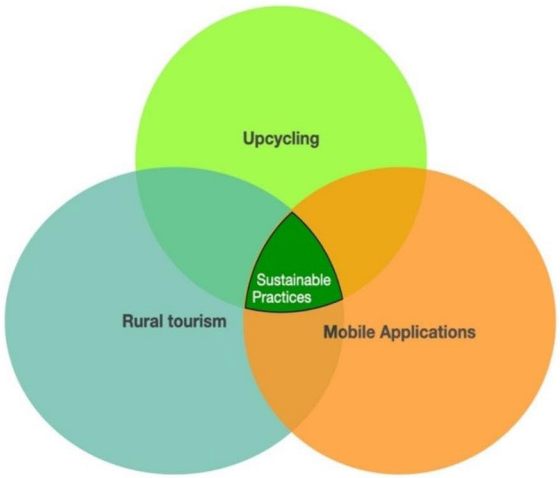

Fig. 1 The intersection of variables for this research study

Table 1 Descriptive data of the owners interviewed

Interview	Age	Municipality	Province	Gender	Education level
1	39	Bayacas	Granada	Female	Secondary
2	66	Riofrío	Granada	Female	Primary
3	45	Parautas	Málaga	Female	Secondary
4	52	Setenil de las Bodegas	Cádiz	Female	Higher education
5	32	Murtas	Granada	Male	Higher education
6	56	Iznajar	Córdoba	Female	Secondary
7	47	Beires	Almería	Female	Secondary
8	41	Ronda	Málaga	Male	Secondary
9	46	Frigiliana	Málaga	Female	Secondary
10	37	Villanueva de las Torres	Córdoba	Male	Higher education
11	27	Montilla	Córdoba	Male	Higher education
12	56	Alpandeire	Málaga	Female	Primary
13	48	Pitres	Granada	Male	Primary
14	31	Cadiar	Granada	Female	Secondary
15	62	Mijas	Málaga	Female	Primary
16	43	Cazorla	Jaén	Male	Secondary
17	49	Níjar	Almería	Male	Secondary
18	56	Cadiar	Granada	Female	Primary
19	31	Alcalá de los Gazules	Cádiz	Male	Higher education
20	58	Mijas	Málaga	Female	Secondary
21	37	Cónchar	Granada	Male	Higher education
22	41	Pozoblanco	Córdoba	Male	Secondary
23	67	Mancha Real	Jaén	Female	Primary
24	38	Yegen	Granada	Female	Higher education
25	32	El Valle	Granada	Female	Secondary

life of tourists at the end of their visit (Sørensen and Hjalager 2020).

3 Methodology

Existing research on rural tourism tends to take specific regions or cities as the unit of analysis (Ayhan et al. 2020; Liu et al. 2018; Wang and Yotsumoto 2019). In this case, the fieldwork focused on the region of Andalusia, in southern Spain. Rural tourism developed in this region is mainly located in areas of great natural value, recognized in various ways: one World Heritage, nine Biosphere Reserve, three UNESCO World Geoparks, and four Specially Protected Areas of Importance for the Mediterranean (ZEPIM) (Junta de Andalucía, 2021). This region received a total of 393,052 travelers in 2019, these being only those staying in establishments with the category of rural accommodation (National Statistics Institute, 2021). In total, this region received 32.5 million tourists in the same year (National Statistics Institute 2021), thus being one of the leading destinations in Europe. Therefore, the selection of this region as an area of analysis is justified, based on the extensive tourist activity consolidated in it.

Rural tourism research methods are diverse, each with their own limitations. Currently, the main research methodologies are based on qualitative descriptions, surveys, construction models, and evaluations of index systems (Christou 2018; Christou and Sharpley 2019; Lin 2019; Nematpour and Khodadadi 2020). The design of the fieldwork which is the basis of this study is based on structured surveys. An email was sent to a random sample of 55 owners of rural tourist homes, located through a website specialized

in rural tourism in Andalusia. In this email their collaboration was requested to participate in the study through a telephone interview and the objectives were explained. Telephone interviews were conducted with the first 25 owners to respond affirmatively. These structured interviews were applied to 25 rural accommodation owners, 15 women and 10 men with ages ranging between 27 and 66. Table 1 shows the data of the interviewees.

The questions were mainly related to their rural accommodation, the products and objects they buy, and the technology they used to get them. The analysis of the structured interviews was conducted using NVIVO. This was carried out considering the different stages to analyze the data (see Table 2 below).

The data analysis followed an inductive coding process defined by the research objectives, in which key themes were identified from the data and were refined as the analysis evolved. This analysis was a recursive rather than a linear process involving a constant moving back and forth between the entire data set, the codes and extracts from the data that the authors identified, and the data produced (based on the triangulation between interviews, secondary sources, and field notes taken from general observations). The analysis began by searching for interesting features in all the transcripts and then gathering relevant data into codes. By bringing quotations of the transcripts for each code from different respondents together, inferences and deductions about the perceptions of the respondents of all these codes were made. As seen in Table 3, twelve main codes emerged from the NVIVO analysis as being central to explaining the phenomenon under study. Several themes emerged from the responses based on these codes.

Table 2 Stages of analysis for respondents selected for the study

STAGES	DESCRIPTION OF THE PROCESS
1. Familiarisation of the data	Listening to all the structured interviews and other relevant materials (secondary sources, observations, and field notes) was done.
2. Creation of a content log	Creation of a content log with important elements of each respondent.
3. Sampling: Searching for relevant data (processing)	Selection of extracts or fragments relating back to the research objectives and literature.
4. Transcriptions	Creating transcriptions and noting down initial ideas.
5. Identifying and refining codes (coding)	Identifying and refining key codes relevant to the research objectives (spider diagram).

Source: (Yin, 2013)

Table 3 Codes that emerged from the NVIVO Analysis

Codes	*List of Codes*	*Drivers*	*Interviewees*	*Research Questions*
C1	Reform family home	(v) (ii) (iv) (c) (d) (e)	14, 8, 1	R2/R3
C2	Family traditions	v) (iv) (b) (c) (e) (d)	19, 6	R2/R3
C3	Economy of the family	(ii) (iv) (v) (b) (e) (c) (d)	25, 1	R2/R3
C4	Traditional values	(iv) (v) (c)	1, 8, 17, 4, 7, 15, 18 (The interviews where it is mentioned the most)	R2/R3
C5	Decoration	(Iv) (v) (d)	20, 14, 10, 13.	R2/R3
C6	Platforms	(e) (b) (i) (ii)	16, 10, 14, 17, 24,8, 21	R1/R2
C7	Wallapop	(e) (b) (i) (ii)	4, 10, 11, 14, 18	R1/R2
C8	Internet	(e) (i) (ii) (v)	10, 1, 12, 16, 25, 17,5	R1/R2
C9	Recycling	(a-e) (i) (ii) (v) (vi)	17,5	R2/R3
C10	Restore used objects	(a-e) (i) (ii) (v) (vi)	11, 21, 6, 14	R2/R3
C11	Cooperate with neighbors	(a) (e) (iv)	11, 13, 14, 16, 17, 24, 25	R3
C12	Ecological	(ii) (vi) (a) (c) (d) €	4, 12, 8	R2/R3

4 Results

This section presents the six themes that emerged from the data analysis using NVIVO (see the Spider Diagram in Fig. 2 for more details about the links between the codes through the possible noding proposed in the first stage). These themes are (1) traditions and family, (2) maintaining cultural values, (3) creating economic impact, (4) environmental consciousness, (5) the use of technology, and (6) local networks.

4.1 Traditions and family

It was apparent from the interviewees' responses that renovating a family house was very important for the respondents to maintain the traditions within the family. According to respondents, this makes the traditional family house more attractive for tourists. One of the respondents highlighted the importance of renovating a family house to contribute to the economy of the town. This is clearly observed in the following excerpt: "Our idea is to recover a traditional home to contribute to the town, to keep it active" (E1).

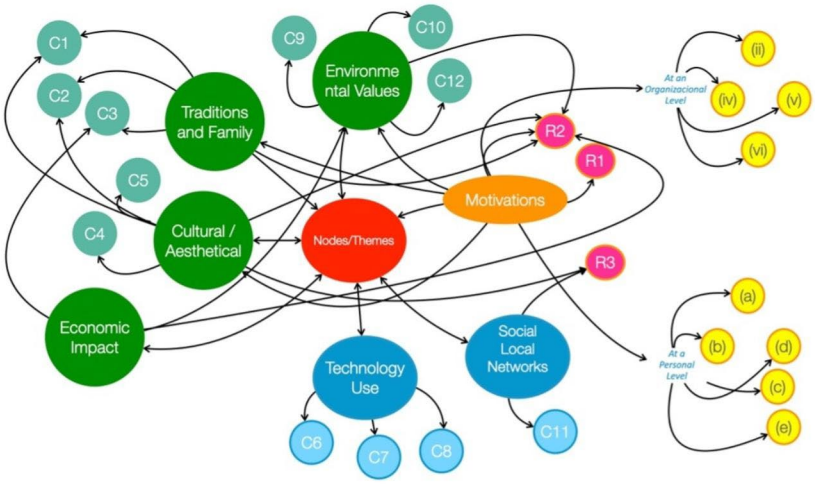

Fig. 2 Spider Diagram with the themes that emerged from the data analysis

Yes, we have. This offers more charm to the house, which is what tourists are looking for. In addition, as I was saying, this is how we bring tourists closer to what was a traditional family home (Interviewee 1).
It is a house that has belonged to my family for a long time and that I have renovated to put it up for rent. It has a lot of charm, both the house and the area (Interviewee 14).

There was also evidence that renovating the house and family objects was crucial to maintaining their traditions and history. This was considered an essential source for their well-being. The following examples highlight this phenomenon.

Some pieces are cheap, others not so much, but if you want to offer a traditional home, you have to look for beautiful pieces (Interviewee 8).
Objects that belong to the family are given a second life; I think that is very nice; we keep the family tradition alive (Interviewee 19).
We spend time making them pretty. This way, we are happy to see tools that have been in my family all my life in good condition (Interviewee 6).
We have also left a lot of furniture and decorations from my parents and grandparents. Especially kitchen utensils because my grandmother was a baker. That makes the house almost look like a field museum. So many tourists have wanted to buy things (Interviewee 10).

4.2 Maintaining cultural values

In several cases, respondents reported that cultural values were a crucial motivator factor for their touristic businesses (see below). This can be illustrated with selected examples drawn from the interview transcripts. For example, a key interviewee who was managing a tourist project explained, "The house cannot be like a city one, it must be special and have charm, traditional furniture, it must represent the place where it is" (Interviewee 1). This example illustrates how cultural values are extremely important in some cases and a way to represent the place where they are located. Therefore, tourism has a very important place, especially for cultural heritage, as mentioned in the existing literature (Jesús and Mendonça, 2018).

The vision would be for tourists to stay in a traditional house, with a culture rich in traditions and to live that experience (Interviewee 7).
Get a decoration that is as cultural as possible, that is not incongruous to what was a traditional village house (Interviewee 7).
I am not Spanish, and I find traditional Spanish culture very attractive (Interviewee 15).
This house respects that essence of an Andalusian town, with very simple decoration, white tones and an interior patio. That is what visitors look for in this town (Interviewee 20).

The findings also show that some of the respondents gave value to esthetic aspects. According to the interviewees, this provides the capacity to elicit pleasure (positive value) when appreciated or experienced aesthetically (Wilson

2016; Tian et al. 2001), as can be seen, expressed by the following quotes:

> *I believe that in this way it helps to keep the essence of the area alive, to make its traditional lifestyle visible. And of course, aesthetically it is a tourist attraction* (Interviewee 18).
> *These products can be beautiful; the energy they have and the way they can be transformed makes it attractive for people* (Interviewee 5).

This relates to the existing literature about the importance of having '*vintage*' objects that makes the space beautiful while at the same time recovering traditions (Sørensen and Hjalager 2020).

4.3 Creating economic impact

The findings indicated that economic benefits were also important for respondents when considering upcycling practices within their touristic business activities. This is in line with previous studies that suggested that creating economic impact and saving money were crucial when considering such practices (Nalewajek and Macik 2013; Sung et al. 2014). An example of this is the following quote where one of the respondents highlighted that using this type of initiative was a good way to attract tourists and earn money:

> *A lot of people are attracted to places that have been renovated and include traditional materials and objects, therefore this can bring us economic benefits* (Interviewee 24).

In addition, respondents reported that this type of dynamic helped them save money as avoiding buying new furniture was very useful for their economy (Prahalad 2006). Respondents claimed they could invest their money in other things that they considered more important to promote their touristic businesses.

> *We save a lot of money like this. Otherwise, if we have to buy new furniture, sofas, etc, it costs a lot of money, we are lucky people appreciate it, and we can use the money to invest in other things such as marketing and promotion* (Interviewee 17).

In several cases, the interviewees reported that it was good to contribute to the local economy of families that did not have many financial resources. Therefore, we can state that these types of initiatives have the potential to become a successful tool for the social and economic development of rural communities.

> *We all win, families earn money from things they no longer use, and we can make rural homes more beautiful* (Interviewee 25).
> *They are usually cheap and easy to find in this area. By buying them, we help people to sell things that they do not know what to do with, and they get some money back. Here the families are very humble; it is always good to help* (Interviewee 1).

4.4 Environmental consciousness

The findings have also shown that touristic activities were encouraged to create beneficial effects for the environment and contribute to environmental protection and conservation (Sung et al. 2014; Wilson 2016). Respondents reported enthusiastically on the plans they had to promote environmental values and continue doing this. As one of the respondents pointed out:

> *We create a charming environment, recover traditional elements of the area, and recycle in the purest sense of the word. We give objects another life and avoid buying new products. In addition, we have always enjoyed the process of restoring objects.* (Interviewee 17).
> *The main goal is to have a charming, special environment considering nature, this is extremely important for us* (Interviewee 5).

The term 'recycling' was emphasized by some of the respondents relating this to the importance of restoring materials. As indicated below, most respondents (80% out of 25 interviewees) responded that they had a clear vision of preserving and restoring materials.

> *Yes, of course, a lot of junk in the garage is now restored and visible. They are things that were not thrown away but that at the time seemed old because new furniture arrived. However, many things were thrown away and it is a shame. Above all, we have used old objects from the house and some things from the fields* (Interviewee 11).
> *Yes, because almost all the objects were part of some profession. For example, the baking sheets are now on the wall, we have made furniture with the old trays. Many containers are now flowerpots. It's nice; we also enjoy restoration* (Interviewee 21).
> *It is an opportunity to recover old objects that no longer had a use, and give them one. I enjoy restoring, and so does my son. We spend time making them pretty. This way, we save money, and we are happy to see tools that have been in my family all my life*

in good condition. It gives us pride. And the visitors like to see these objects as part of the furniture (Interviewee 6).
Make the home more attractive, more integrated into the culture of the area. We also like to restore objects and avoid buying new ones. This avoids spending, consumption and so on. It is a way of recovering the past (Interviewee 14).

Some of the respondents used the term 'environmentalism' when talking about their activities within the tourism sector, as indicated below. But, interestingly, none of the respondents mentioned the term 'upcycling. This indicates that the term was unknown by the participants, and although they are environmentally conscious and aware that this type of practice contributes to the environment, they did not know that what they are doing is called 'upcycling'.

Now environmentalism is in fashion, and this seems to me the most ecological option, do not throw it away; therefore, there is no need to buy anything new. In addition, it gives charm to the house. And of course, unless we are looking for specific parts, it is cheaper (Interviewee 4).
It is not only for the tourists, it is because I also like to see things in the house, rather than in the trash or in a corner. Better to recover than to throw away, more ecological, right? (Interviewee 12).

4.5 The use of technology

The use of platforms was considered crucial for respondents when discussing how to promote and manage their touristic businesses and activities. However, mobile applications were highlighted as being more useful than internet platforms and websites. This relates to the existing literature that argues that technological development can enhance circular economy platforms (Mathews and Tan 2011), particularly online platforms (Mathews and Tan 2011; Ghisellini et al. 2016; Jesus and Mendonça 2018).

Well, the house is advertised on the reservation portals, we have done some online advertising, and payments are made on the platforms (Interviewee 24).
Without online platforms like AirBnB, as well as others specialized in rural tourism, this would be impossible. We have also used Google advertising in some cases. And card payments. We have also searched for information about many aspects online (Interviewee 8).
We have advertised the house on some web pages, and of course reservations and payments are made through internet platforms. Without these platforms, I would not even know how to find clients (Interviewee 16).
The entire rental process is through internet platforms. Very little is done by phone anymore, some by email. We also charge online (Interviewee 10).
Now mobile applications are used more than web pages. It is very useful to give objects a second life so they do not end up in the trash. I see it as more sustainable, more ecological I would say, and it fits with what we need. Some pieces are cheap, others not so much, but if you want to offer a traditional home, you have to look for beautiful pieces (Interviewee 8).

Of those Apps, Wallapop was mentioned as the one that was most used by respondents when looking for second-hand objects as clearly observed below.

Well, before, it was easier to buy from neighbors, because rural tourism had not grown so much. Now we either go to a business dedicated to buying and selling, or use Wallapop, an application to buy and sell junk that you no longer use. So I can see what is in the whole region, although many things have no value, they are not traditional furniture but old furniture, which is different (Interviewee 4).

"*We use Wallapop, above all, because it is very comfortable and works at a distance. If something is far away, the shipping price is not worth it. Younger people are doing this a lot. And many older people are making money with junk that they no longer use, and that was covered in dust* (Interviewee 10)."

I have used them to sell what did not fit in the house, or we were not going to need, and we have gotten some money. Above all, I have used Wallapop and other apps for selling second-hand items. Better than throwing things away, we sell them (Interviewee 11).

Furthermore, respondents commented that the internet was crucial to this type of process, as 72% of the respondents out of 25 interviewees mentioned it as essential for renting their places as well as for identifying objects.

4.5.1 Finding objects

We have searched for objects on the internet because when you buy from strangers, it is easier to get a good

price. If I ask a neighbor and he's seen that I am interested, he will ask me for a lot. With the cell phone, we have looked for many objects little by little. This is not like in other countries; I know that in France there are many markets in towns for these things, but not here because they are not valued. When people realize that they can get some money, they put ads on the internet (Interviewee 10).

With the internet, we have been able to find utensils from the fields, which had no use. So they were thrown out, and we have given them another use. It would be very difficult to find furniture; we cannot go house to house. The internet is very useful. This helps us to keep the image of the area alive so that the knowledge about a plow, a demijohn, an esparto basket is not lost. It is not just decorating; it is preserving who we are (Interviewee 1).

4.5.2 Promoting their services

The entire rental process uses internet platforms. Very little is done by phone anymore, some by email. We also charge online (Interviewee 10).

Yes, with the internet, we manage tourist reservations. This has been a before and after. So tourists find us easily, see the photos of the house and reserve the one they like the most. The most beautiful, cozy, charming, as they say (Interviewee 1).

4.6 Access to local networks

Local networks were also mentioned as an important factor in developing these initiatives, as indicated in the responses obtained from the interviews. Neighbors and relatives were highlighted as being crucial for gaining the objects to decorate their touristic hostels. See examples below. This is extremely interesting as the existing studies conducted about this topic do not emphasize the relevance of local networks.

Some neighbors have given me material and I have bought the furniture, a lot in a store and online, but also from families in the area (Interviewee 25).

Many were at home or at my uncles'. Others I bought to complete the decoration, some I bought from neighbors and others I bought in other towns because Wallapop works very well (Interviewee 14).

Some things were in the house, especially things related to hunting. Some others we have bought from a neighbor. This is a piecemeal task; a pleasant environment is not created in a matter of days or months (Interviewee 16).

We got them from people in the area who no longer wanted them and from the cooperative in the area. We have not bought anything (Interviewee 17).

5 Discussion and conclusions

This paper has shown that technology helps in the use of upcycling practices when considering rural tourism, as demonstrated by the use of mobile applications and websites such as Wallapop. Information and communication technologies can also help connect different stakeholders in the tourism sector (Cortese et al. 2021). This idea is in line with those expressed in previous studies (Prieto-Sandoval et al. 2018; Homrich et al. 2018; James and Lings 2018; Geissdoerfer et al. 2017). In this case, the value of technology is confirmed within the context of rural tourism, as a complement to traditional social and family networks. Second, this article provides evidence of the different factors that promote upcycling in this context: local networks and family, traditions, creating economic impact, environmental consciousness, the use of technology, and maintaining cultural values. These findings are in line with existing studies that have observed that people often perform upcycling practices based on motivations such as environmental concerns (Sung et al. 2014; Wilson 2016), saving money (Nalewajek and Macik 2013; Sung et al. 2014), the relaxation and personal satisfaction that is associated with the process (Wilson 2016; Sung et al. 2014) and even motivated by the aesthetic and singular value of the creations (Wilson 2016; Tian et al. 2001).

In addition, the research findings revealed that upcycling is crucial for preserving the traditions and cultural values of the region. This being one of the aspects traditionally associated with upcycling (Jesús and Mendonça 2018). Finally, the research did not find evidence of innovation as a driving factor for these types of initiatives, as presented in other studies (Jayasinghe et al. 2021; Bymolt et al. 2015; Storey et al. 2015). However, an interesting finding that was not mentioned in the existing literature and that we believe makes a great contribution to the existing literature was the relevance of local networks for developing such practices. This is an important contribution of this research where respondents highlighted that they frequently used objects from their neighbours. This idea is in line with what was pointed out by Ferasso et al. (2020), in relation to the importance of social networks in the circular economy.

In this paper, the authors have explored the drivers that enhance upcycling practices in rural tourism, specifically studying the role of mobile applications that facilitate the exchange of second-hand objects. In this work, the term 'upcycling' has been used as a broad concept that encompasses all materials or objects that are not used and are reutilised to give them an added value. This paper has made significant contributions to the existing literature by expanding the literature on the sustainability of rural tourism and its role in conserving the cultural heritage of the environment. The latter is of special interest, given that tourism has traditionally been blamed for standardizing environments and damaging the traits of the traditional culture of destinations (Martín et al. 2020). The current context of the pandemic will generate changes in the tourism sector, such as a greater importance of sustainability or changes in the patterns of social interaction Bresciani et al. 2021; Madanaguli et al. 2021:10) state "As awareness of environmental issues rapidly increases, customers are becoming increasingly conscious of eco-friendly businesses". Specifically, the theoretical contributions of this study can be summarized as: the role of technology as a facilitator of upcycling is highlighted, drivers of upcycling practices are exposed, evidence of the role of upcycling to preserve cultural elements is offered. In relation to tourism, it stands out how upcycling is used to try to offer tourists the image of the destination they hope to find. The study was based on fieldwork carried out in September 2021 in the Spanish region of Andalusia, where 25 rural accommodation owners were interviewed. At this point, the research questions posed are taken as references and connected to the results finally obtained. RQ1: Does technology facilitate the development of upcycling in the context of rural tourism? This study provides evidence for the importance of technology to facilitate upcycling in rural areas. Mobile phone applications allow second-hand objects to be located in the immediate environment, completing traditional social networks. RQ2: What are the factors that drive upcycling in this context? The main factors described through field work are: local networks, traditions, family, creating economic impact, environmental consciousness, the use of technology, and maintaining cultural values. RQ3: Does upcycling contribute to preserving traditional and cultural elements? Yes, explicitly reference is made to the value of this activity to preserve local identity. Although sometimes this preservation may be motivated by the image that tourists expect to find. Public authorities should take these drivers as a starting point for the design of policies to promote upcycling. They should appreciate the value of this activity to preserve cultural elements and recognize the value of technology as a complement to traditional social networks. One of the limitations associated with the implementation of upcycling is the difficulty in developing large-scale processes (Zhao et al. 2022). Co-creation activities could even be promoted between tourists and locals, whose objective was to give a second life to traditional objects. Co-creation can increase the satisfaction of the stakeholders involved (Serravalle et al. 2019). In relation to this and given the advantages it brings to the local community, public authorities should support the development of so-called circular tourism (Kunwar 2020). This would be reflected in the definition of projects focused on sustainable tourism development, which promote the preservation of local cultural identity through upcycling and its integration into tourist environments. Companies must rethink the way they offer value to their customers, in line with what Suchek et al. (2021) pointed out.

To conclude, we recognize both the limitations in our research and the scope for future research. While this represents an interesting study to understand the role of upcycling practices and the use of technology and how this contributes to the development of the touristic sector, we cannot say that it is generalizable since it is considered a particular phenomenon in a particular region, which makes generalization difficult to apply to other situations. The social and cultural characteristics of each region can affect motivations and objectives. Furthermore, rural accommodation owners may be conditioned by the image sought by international tourists, based on cultural clichés. Therefore, to overcome this limitation, comparative studies are required that provide a greater base of interviews. Based on the current work, it would be appropriate to look at upcycling, technology, and rural touristic businesses in other Spanish regions and other European countries to examine to what extent they contribute and how they can influence these practices. It would also be good to conduct an international comparative study between rural tourism businesses that work with upcycling in different regions and analyze their differences in terms of resources and infrastructure. It may be very interesting to analyze how the social and cultural context influence the motivations for upcycling in the tourism sector.

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