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Acceptance of circular entrepreneurship: Employees' perceptions on organizations' transition to the circular economy

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ABSTRACT

The Circular Economy (CE) - based on five principles (reduce, reuse, refurbish, repair, and recycle) - has received increased attention in both academia and practice in recent years. The transition to CE by public and private organizations can be seen as an entrepreneurial act encompassing their strategic policies, business models, structures, and processes. Little is known about the involvement of employees of organizations making this transition. Therefore, this study investigates the influence of organizations' commitment to the five CE principles on their employees' perceptions of the usefulness, ease of implementation, and acceptability of the principles. The method used is exploratory, a mixed-method approach combining PLS-SEM and fsQCA. This research contributes to the field by developing a unified theoretical perspective on the entrepreneurial context. It also highlights the impact of CE principles on organizations that are transitioning to more sustainable development.

1. Introduction

The circular economy (CE) is increasingly gaining attention and interest from researchers, practitioners, and politicians. In 2011, about 80 billion tons of minerals, fossil fuels, and biomass were used to power the world economy. This number is likely to increase as populations grow and living standards rise. If nothing changes, resource use could significantly increase over the next few decades. According to the European Parliament (2023), "*the circular economy is a model of production and consumption that involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products for as long as possible.*" In this way, the life cycle of products is extended. In recent years, it has become clear that public institutions and governments have been key to the growing importance of CE in business (Bocken et al., 2016; de Arroyabe et al., 2021; Katz-Gerro and Lopez Sintas, 2019; Lewandowski, 2016; Dana et al., 2022).

Major contributions to CE studies have emerged in the last decade (Jabbour et al., 2019; Pieroni et al., 2019). The term "*circular economy*" *describes the movement, or "cycling," of nutrients or the transfer of energy between different components of a natural ecosystem.*" (Cecchin et al., 2021). 'In this regard, a global trend is driving the attention of the community to investigate potential pathways for the transition to circular business models (CBMs). In general terms, CE aims to improve resource efficiency, focusing on urban and industrial waste, capability methods, and renewable resources, to reach a better balance in economy, environment, and society' (Elia et al., 2017; Hueso-González et al., 2018). Accordingly, CE represents an economic model that aims to align economic and environmental goals by using an innovative approach to solve problems between organizations and their environment (de Arroyabe et al., 2021; Kim, 2023). CE is an economic system that aims to substantially change how people interact with the environment by stopping resource loss, shortening energy and material cycles, and promoting sustainable growth. It does this by taking action at three different levels: micro (consumers and businesses), meso (economic actors working together in a mutually beneficial way), and macro (cities, regions, and governments) (Prieto-Sandoval et al., 2018).

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The process of moving toward a CE involves slow changes in how organizations manage innovation and do business, and the current theoretical framework makes it possible for us to use global studies from different fields to learn more about the CE and how it works. The European Commission (2020) has initiated a specific action plan for CE, encouraging more sustainable product development and waste reduction, and giving consumers more power. As a result, actions have been taken in different fields, such as electronics, information and communication technology (ICT), plastics, textiles, and construction.

Based on recent European regulations and the search for sustainable development goals, this new paradigm is prompting economic actors to take a more systematic approach and slowly change their businesses into more sustainable ones. Scales are a good way to measure how the CE principles are used in an organization because they provide a comprehensive framework for estimating how well the organization is doing in this area and where it might need to improve (Moraga et al., 2019). Relevant criteria for choosing the right scale are still unclear, since it depends on the company, its goals and which industry it is in. That is why the current study considered using scales as experimental.

The CE is a concept used in different fields, including economics, biology, climate change, logistics, marketing, and management. Many researchers have investigated the CE phenomenon in this latter field, aiming to identify the strategies and frameworks adopted by companies in pursuit of CE goals. For example, more and more stakeholders are paying attention to whether CE principles are being implemented (Geissdoerfer et al., 2017), which is a measure of whether the levels of knowledge and skills required for a sustainable society are being acquired (Genovese et al., 2017).

The transition of public and private organizations towards the CE can be conceptualized as an entrepreneurial act encompassing their strategic policies, business models, structures, and processes, thereby contributing to society and the economy (Wennekers & Thurik, 1999; Acs & Szerb, 2007; Galindo & Méndez, 2014; Lin, 2022; Marín et al., 2021). While research on entrepreneurship and entrepreneurial ecosystems tends to view entrepreneurship in a static and binary way, in which one is either an entrepreneur or one is not (Lortie et al., 2021; Nummela et al., 2022; García and Romero, 2021; Guerola-Navarro et al., 2023; Huang et al., 2022; Santos-Vijande et al., 2022; Teng et al., 2023), we argue that entrepreneurial behaviour can also be found in organizations that do not define themselves as primarily entrepreneurial. More specifically, given the relevance of societal factors to the adoption of the CE, we argue that the absence of an understanding of institutional drivers and barriers in current CE research constitutes an important research gap. Furthermore, the literature has highlighted that the relationship of the CE with society has not been investigated sufficiently thoroughly. Several studies have suggested that this phenomenon should be the focus of in-depth research. The CE is multifaceted, and its social aspects can be understood from different angles (Quintelier et al., 2023). To transform their circular strategies and operations, companies must, therefore, discuss their practices and working guidelines with key stakeholders (Dominko et al., 2023): for example, few studies have examined the CE from the employee's point of view. Recently, investigating employees' private environmental orientations has been seen as offering environmental improvements within companies (Palmié et al., 2023), increasing the company's efficiency and effectiveness. Although the latter study makes an enlightening contribution by showing how employees' private attitudes towards the environment influence their behaviour at work, enhancing companies' economic value creation, this field is still underexplored. As far as we know, there is a clear gap in the literature in that the predictors of employees' willingness to support the implementation and performance of the CE in their organisation have not been identified. Although employees are one of the most important stakeholder groups, playing a crucial role, they are ignored.

This study is unique because it uses the 5R model (*Reduce, Reuse, Refurbish, Repair, and Recycle*) as independent variables and predictor assets towards reaching a cascading triple outcome setting. That is, adaptations of the Technology Acceptance Model (TAM) to show how useful people think it is to implement the CE principles into an organisation, how easy it is to implement the CE principles into existing structures and processes, and how willing employees are to accept the CE principles.

CE entrepreneurship is a way of achieving CE goals, as companies play a relevant role in promoting the transition to CE (Geissdoerfer et al., 2017; Esposito et al., 2018; Pieroni et al., 2019). In doing so, CE entrepreneurship envisions business opportunities from the CE perspective, targeting customers that are sensitive to CE, producing goods according to the CE precepts, and selecting raw materials from sustainable suppliers. Thus, value creation, delivery, and capture need an aligned business model, which is achieved thanks to the CE business model (Ferasso et al., 2020; Henry et al., 2020; Muldoon et al., 2022).

Considering the relevance of circular entrepreneurship in fostering the implementation of the CE, this research aims to unveil the role of organizations' commitment to the five CE principles (reduce, reuse, refurbish, repair, and recycle) in how their employees perceive the usefulness, implementability and acceptability of the principles of CE. Against this background, this research sheds light on a phenomenon that is not yet fully understood from the perspective of employees' perceptions, since the staff are relevant for implementing CE activities. We therefore pose the following research question: *How does an organization's commitment to the CE principles affect employees' willingness and ability to implement them, and what impact does this have on successful circular economy initiatives?*

We adopted a mixed-methods approach to identify the drivers of employees' behaviour toward the CE principles. PLS-SEM and fsQCA can provide comprehensive quantitative and qualitative data, respectively, for exploring the phenomenon under study.

The present study includes seven sections. After the introduction, we outline the relevant theoretical background from the existing literature about why entrepreneurship and sustainable development should always be looked at together. Section 3 presents the data and how we obtained our exploratory results. Section 4 discusses our exploratory results and their meaning for the body of knowledge. Finally, we conclude and provide practical and managerial implications, limitations, and further research in sections 5, 6, and 7.

2. Theoretical background

2.1. Sustainable businesses in a Circular Economy context

In 1987, the UN World Commission on Environment and Development (WCED) issued a report called "Our Common Future," which introduced the idea of sustainable development (Dhahri et al., 2021). Much academic research has examined the circular economy within companies, stimulated by its relevance, both academic and practical (Bag et al., 2022; Chaudhuri et al., 2022; de Arroyabe et al., 2021; Ferasso et al., 2020; Suchek et al., 2022). Several studies have investigated the dynamic connections involved in the relationship between the CE and entrepreneurship. Entrepreneurship research has begun to include cognitive and behavioural insights from research areas such as social psychology (Drăgan et al., 2023; Omorede et al., 2015) in seeking to predict entrepreneurial behaviour (Gorgievski & Stephan, 2016; Manea et al., 2021). Such studies made several contributions, especially conceptual extensions like circular business model typologies (e.g., Bocken et al., 2016; Lewandowski, 2016), providing insights into their different facets, such as processes, roles, or managerial mechanisms.

The importance of the CE from a business perspective is well established in the literature, as numerous works have highlighted how the CE represents a paradigm shift whereby waste is rebuilt into resources by reusing and regenerating. Beyond the economic benefits afforded by resource efficiency and industrial transformation, this involves redesigning future business models and consumption approaches through recovery and regeneration (Esposito et al., 2018; Pieroni et al., 2019).

Nevertheless, some aspects are still only partially explored and researched, particularly regarding how entrepreneurial behaviour is framed in CE environments and dynamics. Furthermore, some authors have pointed out the variety of definitions of this phenomenon due to the interdisciplinary nature of CE, and several gaps can be identified. For example, several studies have attempted to identify and classify sustainable business models, but they have been very different from each other in many ways, including the sectors and fields of investigation covered, in types of sample and in the countries and national policies examined (Suchek et al., 2022; van Bommel et al., 2020; Ferasso et al., 2020).

Similarly, although the concept of the CE is widely explored and several case studies have analyzed its application in different contexts, there is as yet no universally accepted definition of tools and criteria by which to measure the level of circularity of products, companies, or regions (Haas et al., 2015). Indeed, several definitions of the CE have been presented between the various scientific fields and schools of thought, each emphasizing different dimensions of material preservation and economic development. The work of Kirchherr et al., (2017) showed that the definition of the CE encompasses a wide range of dimensions. They found that the economic and environmental dimensions were the most widely addressed, while only 20 % of the definitions reviewed looked at the social perspective. This work also demonstrated that most definitions of the CE have focused on the CE principles inspired by the well-known "4R" model: reuse, recover, reduce, and recycle.

Henry et al. (2020) examined circular business models (CBMs) and strategies adopted by sustainable startups. The authors analyzed 128 selected companies within CE ecosystems in Europe and identified five archetypes of sustainable business models: design-based, waste-based, platform-based, service-based, and nature-based startups. Here, the outcomes highlight the impact of the level of circularity on the typology of the sustainable business model, ranging from highly flexible to least flexible. A high level of circularity drives a radical, sustainable entrepreneurial model, whereas a low level generates a moderate, incremental one. Moreover, whereas CE is commonly viewed as a vehicle to achieve sustainability, but with a closer focus on the economic and environmental dimensions, not all types of systems incorporating CE principles are inherently more sustainable (Pieroni et al., 2019; Geissdoerfer et al., 2017).

Entrepreneurial behaviour and the decisions related to the CE are linked to the founder/CEO, but little is known about the employees' perceptions of such drivers in the circular entrepreneurship approach. Only Mehrotra and Jaladi (2022) have considered employees in analyzing the practices related to circular business models implemented by startups. The authors found that such companies have common patterns in building value propositions for their customers through co-creation. Although the founder makes most of the business decisions, it is clearly employees who implement these circular economy decisions, and we do not yet know how the CEO's or founder's behaviour can influence the adoption of a circular economy within the company by its employees or how it can affect how aligned they become with his/her behaviour.

This study aims to identify key determinants of the CE principles, in order to complement previous works that investigated sustainable entrepreneurial behaviour and circular business models. The novel focus of this paper is on employees' perceptions and the extent to which these predictors could shape their behaviour vis-a-vis their companies' shift towards the circular economy.

The 3R principles—reduce, reuse, and recycle—have largely framed and operationalized the circular economy. Managers, businesses, and public institutions have added other R practices to the R frameworks that academics suggested, ranging from energy recovery to actions of reuse, repair, refurbishment, remanufacturing, and repurposing, among others. Elia et al. (2017) provided a review of 16 CE indicators and 14 environmental assessment methodologies and examined them under 5 CE requirements: 1) reduced inputs and use of natural resources; 2) increased share of renewable and recyclable resources; 3) reduced emissions; 4) reduced loss of valuable materials; and 5) increased sustainability of product value. Consequently, several conceptual frameworks have emerged to complement R practices and assist organizations in implementing circularity (Klein et al., 2020; Kristensen & Mosgaard, 2020).

To cover the research gap more effectively and address our research question, we deploy the 5R model (Reduce, Reuse, Refurbish, Repair, Recycle), as it is more suitable and provides a wider range of factors that can be tested empirically. The framework is also the most commonly used one and comprises the main aspects of the CE, which are also clearly defined (Reike, Vermeulen, & Witjes, 2018).

2.2. 5-R CE Framework: Predictors of CE acceptability for employees

Most previous contributions to circular strategies among organizations are built on several R frameworks, ranging from 3 to 10 Rs (Reike et al., 2022; Vermeulen et al., 2018). Among these Rs, "reduce" is considered the principal foundation of all CE initiatives (Jabbour et al., 2019; Pieroni et al., 2019; Witjes & Lozano, 2016). R strategies vary with sector, country, and context. For example, some works used the 3Rs (Reduce, Reuse, and Recycle) to understand better the CE practices and strategies of certain governmental institutions (Klein et al., 2020). The 4Rs result from the Ellen MacArthur Foundation's Butterfly Diagram, which added specific actions and the consideration of renewable energy sources to introduce a cross-sectorial approach (Geissdoerfer et al., 2017; Urbinati et al., 2017). The most comprehensive framework so far is the 9R model, which is specifically dedicated to the pharmaceutical industry due to the particular impacts this industry has on the environment (Ang et al., 2021).

The implementation of CE practices in an organization and the adoption of a sustainable business model depend on the organization's stakeholders, particularly employees, who can act as enablers, or barriers, or be neutral (Soni et al., 2023). To foster employee engagement, managerial support is crucial (Marrucci et al., 2022).

Employee engagement with the CE can increase over time and can be conceptualized as an individual and organizational learning process (Lopez and Esteves, 2013; Matricano et al., 2019). In particular, employees need to understand the CE principles, and their usefulness. Therefore, we follow the notion of the widely-used Technology Adoption Model (TAM), which predicts when a novel technology will be used (Davis, 1989); it is applied in many fields, such as digital technologies (Grover et al., 2019), consumer behaviour (Suleman & Zuniarti, 2019), and health (Kamal, Shafiq, & Kakria, 2020), to name a few. Whereas CE is not a technology, perceived usefulness is also the prerequisite for the adoption of novel principles, such as CE, i.e., if employees are not convinced of the usefulness of the CE principles, it is unlikely that they adopt them voluntarily. Following the 5R framework, we hypothesize that perceived usefulness depends on an organization's commitment to the 5Rs: reduce, reuse, refurbish, repair, and recycle.

H1: An organization's commitment to reducing the use of non-renewable resources increases the perceived usefulness of the CE principles in the eyes of its employees.

H2: An organization's commitment to reuse systems and practices increases the perceived usefulness of the CE principles in the eyes of its employees.

H3: An organization's commitment to refurbishing (i.e., collecting discarded products or materials that can be refinished and sanitized to serve their original functions) increases the perceived usefulness of CE principles in the eyes of its employees.

H4: An organization's commitment to repairing products and materials (to extend their life-cycle) increases the perceived usefulness of the CE principles in the eyes of its employees.

H5: An organization's commitment to recycling increases the perceived usefulness of the CE principles in the eyes of its employees

2.3. Outcome framework (perceived usefulness, ease of implementation, acceptance of the CE principles)

In our conceptual model, we relate the employee's perception of the usefulness of the CE principles to two consecutive outcomes. First, we propose that this perception also leads employees to perceive that these principles can be easily implemented in their organization's structures and processes. Second, we hypothesize that this perception leads to greater acceptance of the CE principles.

Concerning the second notion, employees typically understand well how an organization's change process affects them, their team, and their work environment, and whether it improves or diminishes performance (Parry et al., 2014). Changes perceived as beneficial enable them to pursue organizational goals with greater enthusiasm and to have more confidence in the changes (Bass and Avolio, 1994). If employees are not convinced of the usefulness of changes initiated by management, they can become barriers to change. Therefore, we reverse the causality between the perceived usefulness of the CE principles and the perceived ease of implementing these principles. If an employee views the change process as useful, they will not be a barrier to that change, thereby making it easier to implement and more acceptable to alter the organizational status quo.

Specifically, the TAM can be a useful model for the implementation of the CE among employees when they understand the usefulness, ease of implementation, and acceptability of a specific CE action related to the 5Rs. In this way, the employees' behaviour and acceptance of engaging CE principles depend on their perceptions of its usefulness and how easy it is to implement a 5R action. We, therefore, hypothesize:

H6: When employees perceive the usefulness of the CE principles, they believe more strongly in the possibility of implementing them in their organization's structures and processes.

H7: When employees believe that the CE principles can be easily implemented in their organization's structures and processes, they accept them more readily.

3. Methodology

3.1. PLS-SEM methodology

By using partial least squares structural equation modelling (PLS-SEM) and fuzzy-set qualitative comparative analysis (fsQCA), we are combining a statistical with a comparative approach that fits with a small sample size, proposes different solutions for an outcome to occur, and exhibits these solutions in terms of configurations. PLS-SEM is especially useful when the user's goal for a given phenomenon is to determine the independent net effect of some conditions on the target-dependent variable. However, QCA is particularly valuable when the aim is to understand the combined and simultaneous effect of some combined conditions on the target outcome. Combining the two approaches allows us to explore the individual and collective impacts that our conditions may have on the outcome of interest.

While PLS works best when composites are taken, SEM can be used to study both experimental and non-experimental data (Dash & Paul, 2021).

Structural equation modelling (SEM) has become a quasi-standard in recent research approaches based on the analysis of cause-and-effect relationships between latent constructs (Muntean et al., 2023; Capatina et al. 2020; Lupoae et al. 2023), The way the PLS-SEM methodology works is that it iterates back and forth multiple times, optimizing first the measurement model and then the structural model, continuing until the ultimate objective of optimizing prediction, and not model fit, is achieved (Hair & Alamer, 2022).

Our proposed model consists of five antecedent conditions or independent variables (Reduce: RED from now on, Reuse: REU from now on, Refurbish: REF from now on, Repair: REP from now on, Recycle: Rec from now on) and three dependent variables (considered outcomes) that are connected and dependent on one another (Perceived usefulness: USE from now on; Ease of implementation of Circular Economy Principles: EASE from now on; and Acceptance of Circular Economy Principles: ACC from now on).

3.2. fsQCA methodology

While most previous studies have focused mainly on the net independent effect using traditional statistical models, this paper uses a case-oriented approach, namely qualitative comparative analysis (QCA). QCA has several advantages. First, it can be applied to studies with a small sample size. Second, it is based on the principles of set theory, which permit the inspection of interplays that develop between different conditions. Third, QCA supports multiple causation, which means that various combinations of conditions may contribute to a particular outcome. This is especially relevant to the adoption of the circular economy because employees differ personally and demographically in ways that influence their preferences. In addition, it is based on equifinality, allowing different solutions for an outcome to occur.

The first step in conducting a QCA analysis is calibrating dependent (the outcome) and independent variables (the conditions) into fuzzy or crisp sets. Fuzzy sets range from 0, which denotes an absence of set membership, to 1, which indicates full set membership. Crisp sets fit better with binary conditions that have two values (0 or 1).

Through QCA, we discover multiple possible patterns in employees' behaviour amongst the collected cases, ranging from high to low or no perceived usefulness of implementing the CE 5R principles into organizational environments, high to low or no perceived ease of implementing the CE 5R principles, and high to low or no acceptance of the CE 5R principles being embedded into the current business environment. FsQCA uses an inductive research model based on conjunction, equifinality, and causal asymmetry. This model works well for research on sustainable entrepreneurship.

When conceptualizing the proposed model, we chose the variables that could best be regarded as causes: RED, REU, REF, REP, and REC. We assumed that these conditions are sufficient to bring about the three expected cascading and dependent outcomes: the perceived usefulness of implementing the CE 5R principles into organizational environments, the perceived ease of implementing the CE 5R principles into existing business models, and the perceived acceptance of the CE 5R principles being embedded into the current business environment.

We used FS/QCA 4.0 to combine fuzzy sets and logic principles with qualitative comparative analysis (QCA) (Ragin, 2000). The software identifies multiple possible patterns and paths that probably explain the expected outcomes.

3.3. Sample and data collection

Data was collected using an online questionnaire via Google Forms from December 2022 to the end of January 2023. The pool of respondents (Table 1) was reached via social media platforms and direct messaging from the author's network that fit the selection criteria and are presented in the table below. It is important to mention that different factors, such as limited access to the target population, budget constraints, and time limitations, influenced the decision regarding the sample size. To overcome this issue, considerable recent research has been established to build the conceptual framework. The research model was inspired by and conducted based on previous literature, which could add credibility and validity to our results. Additionally, the Bootstrap procedure was undertaken to enhance the reliability of our estimates.

Furthermore, the study uses QCA, which relies on set theory and Boolean algebra. QCA is a comparative approach and not statistical. This

Table 1
Demographics.

I work in the following domain:	Agriculture – 3 Commerce – 23 Education – 34 Finance – 9 Healthcare – 4 HoReCa – 1 Industry – 6 Insurance – 1 IT&C – 11 Legal – 2 Public administration – 1 Showbusiness & arts – 1 Transportation – 3 Wellness & beauty – 2 Other – 2	Age interval	18 – 20 years – 2 21 – 30 years – 44 31 – 40 years – 30 41 – 50 years – 21 51 – 60 years – 5 60 years – 1	Education level	High school – 16 Bachelor's degree – 31 Master's degree – 31 PhD – 18 Post-doctoral degree – 7
Work experience	< 1 year – 7 1 – 5 years – 26 5 – 10 years – 30 10 – 15 years – 11 15 – 20 years – 17 20 – 25 years – 2 > 25 years – 10	Age of the organization	< 1 year – 12 1 – 5 years – 20 5 – 10 years – 17 10 – 15 years – 12 15 – 20 years – 8 20 – 25 years – 7 > 25 years – 27	Private / public sector	Public sector – 30 Private sector – 73
Profit / non-profit	For-profit company – 76 Non-profit company – 27	Employees in company	< 10 – 13 11 – 25 employees – 17 26 – 50 employees – 6 51 – 100 employees – 11 101 – 500 employees – 18 > 501 employees – 38	Gender	Female – 56 Male – 47
Respondents country	Austria – 1 Bangladesh – 1 Brazil – 2 Canada – 3 France – 30 Germany – 13 India – 2 Italy – 1 Lebanon – 1		Morocco – 1 Pakistan – 1 Moldova – 1 Romania – 30 Saudi Arabia – 2 South Africa – 1 Switzerland – 1 Tunisia – 3 UK – 3 USA – 6		

method was initially designed to handle a small sample size, which could also add credibility to our findings.

3.4. Conceptual model and measures

The proposed conceptual model considers five independent variables / antecedent conditions and their impact on the three expected cascading and mutually dependent outcomes (Fig. 1 and Appendix 1).

3.5. Calibration process

We calibrated the data using external criteria (Table 2), in line with the research question's conceptualization, definition, and labelling. Using fsQCA methodology, we calibrated the raw data by the direct method, specifying the values of an interval scale that corresponds to the three qualitative breakpoints that structure a fuzzy set: full membership (5), full non-membership (1), and the crossover point (3) (Ragin, 2000). The original interval scale values are then turned into fuzzy membership scores with the help of these three benchmarks. The product of this method is the fine-grained calibration of the degree of membership of cases in sets, with scores ranging from 0.05 to 0.95 (with a 0.05 standard error deviation).

4. Results

4.1. PLS SEM

The results of the study are presented in two parts. First, the validity and reliability of the measurement model are evaluated by reporting the results of the outer model. Second, the results of the inner model, regarding the assessment of the structural model, are described through the examination of common metrics in partial least squares (PLS) analysis and hypothesis testing. The data analysis was conducted using the SmartPLS 4 software. The study involved adjusting specific settings in the software, including selecting the path weighting scheme with a maximum iteration limit of 300 and a stopping criterion of 10—7. Additionally, 5,000 subsamples were employed through the bias-corrected and accelerated bootstrap method to attain stability in the model estimates and to determine the confidence intervals. The null hypothesis was rejected if the results were significant at 5 per cent (one-tailed).

Table 3 displays the distribution of indicators, the items encompassed within the proposed conceptual model. The standard deviation does not provide evidence of significant disparities between indicators. Additionally, it is important to note that FL represents factor loading, and SD represents standard deviation.

Table 4 highlights AVE - average variance extracted, α Cronbach's Alpha, ρA DijkstraHenseler's rho_A, CR Composite Reliability. Item dropped as its loading did not exceed the cut-off requirement of 0.50 set by Hair et al. (2006).

4.1.1. Measurement model assessment

To test the validity and reliability of the model, several common metrics were utilized in partial least squares (PLS) analysis. The convergent validity was inferred through the examination of loading factors and the average variance extracted (AVE – Table 3). It was expected that the loading factors of the indicators in the model should be greater than 0.7 and the composite reliability values for constructs should exceed 0.70, as recommended by Hair et al. (2006). Additionally, the AVE value, which indicates the amount of variance explained by the

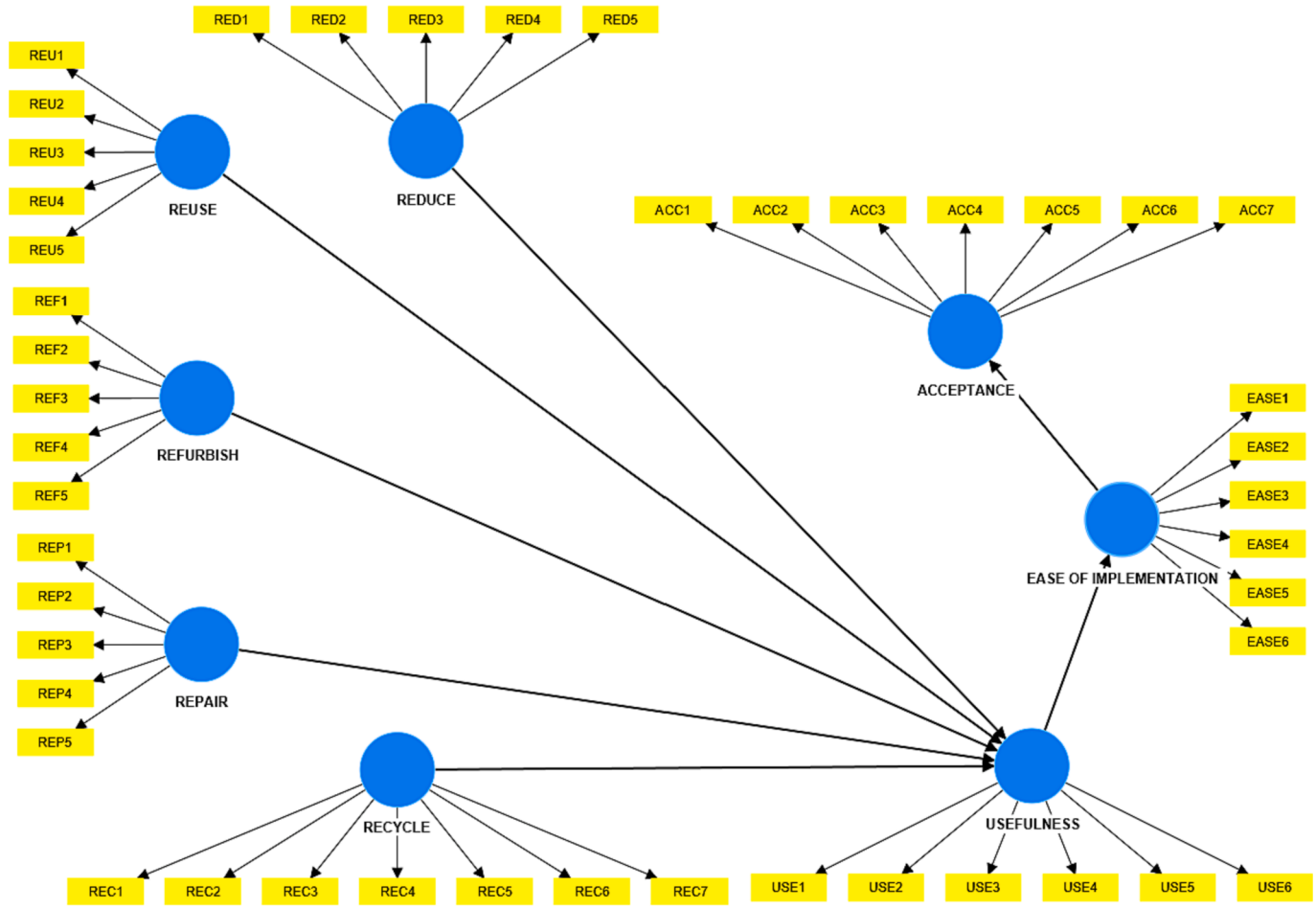

Fig. 1. Research conceptual model, original contribution by the authors. Output source: Ringle, Christian M., Wende, Sven, & Becker, Jan-Michael. (2022). SmartPLS 4. Oststeinbek: SmartPLS. Retrieved from https://www.smartpls.com.

Table 2
Calibration of scales.

Scale point	Fuzzy-set value	Membership
Strongly agree	0.95	Fully in
Agree	0.75	More in than out
Indifferent	0.500	Crossover (neither in nor out)
Disagree	0.25	More out than in
Strongly disagree	0.05	Fully out

(Adapted from Ragin, 2000).

construct, should be greater than 0.5 (Hair et al., 2019). In some instances, a loading factor value between 0.50 and 0.60 may be obtained, but it can still be considered acceptable if the AVE (Table 3) value meets the minimum threshold for content validity. The results of the convergent validity analysis are presented in Tables …, showing that the rule of thumb and threshold values for good convergent validity have been met.

The internal consistency reliability was assessed by two measures: Cronbach's alpha (α) and Dijkstra-Henseler's ρA. While Cronbach's alpha is a conservative indicator, particularly useful with a small sample size and a low number of indicators, ρA provides a good representation of a construct's reliability. The recommended threshold values for both measures range from 0.70 to 0.90. The results of the construct reliability analysis are shown in Table 3 and demonstrate that the model meets the rule of thumb for reliability.

Discriminant validity refers to the extent to which the measures of different constructs are different from one another. This can be evaluated by comparing the correlations between the constructs with the square root of the AVE for a given construct (Fornell & Larcker, 1981). As shown in Table 5, the diagonal elements, which represent the square root of the AVEs, are always larger than the off-diagonal elements in their respective rows and columns, demonstrating that discriminant validity has been established.

Diagonals represent the square root of the AVEs, while the off-diagonal entries represent the correlations between constructs.

4.1.2. *Structural model assessment*

We utilized the inner model of PLS to evaluate the structural model with respect to the quality of the PLS model. This enabled us to determine the explainable variance in the model, the impact and contribution of each variable, and the significance of the relationships between the hypothesized variables.

We adhered to the core metrics suggested by various experts (Hair et al., 2019) to analyze the structural model. These include the coefficient of determination (R2 – Table 6), effect size (f2 Table 7), predictive relevance (Q2 – Table 8), and variance inflation factor (VIF – Table 3).

4.1.3. *Testing of hypotheses*

Parametric significance tests cannot be used to determine the significance of coefficients like outer weights, outer loadings, and path coefficients because PLS-SEM does not require normally distributed data. Instead, PLS-SEM uses a nonparametric bootstrap method to test the significance of estimated path coefficients (Davison and Hinkley, 1997; Efron & Tibshirani, 1986).

Bootstrapping implies that random subsamples are selected from the baseline data set. The subsamples are then used to predict the PLS path

Table 3
Measurement model assessment.

	Mean	Median	SD	FL	VIF
Reduce					
RED1	3.612	4	1.345	0.891	4.168
RED2	3.68	4	1.331	0.89	3.987
RED3	3.214	3	1.334	0.748	1.572
RED4	3.67	4	1.257	0.754	1.935
RED5	3.427	3	1.228	0.836	2.198
Reuse					
REU1	3.641	4	1.237	0.67	1.595
REU2	3.583	4	1.25	0.807	1.962
REU3	3.825	4	1.202	0.828	2.075
REU4	3.718	4	1.092	0.841	2.057
REU5	3.68	4	1.232	0.815	2.178
Refurbish					
REF3	3.903	4	1.162	0.775	1.452
REF4	3.369	3	1.358	0.865	1.816
REF5	2.709	2	1.556	0.752	1.361
Repair					
REP1	3.99	4	1.057	0.713	1.646
REP2	3.893	4	1.023	0.771	1.957
REP3	3.718	4	1.169	0.771	1.852
REP4	3.728	4	1.099	0.85	2.113
REP5	3.67	4	1.177	0.811	1.652
Recycle					
REC3	3.107	3	1.35	0.711	1.72
REC4	3.583	4	1.445	0.721	1.504
REC5	3.117	3	1.43	0.81	1.607
REC6	3.621	4	1.387	0.574	1.65
REC7	3.592	4	1.361	0.751	1.852
Perceived Usefulness					
USE1	3.466	4	1.221	0.849	2.854
USE2	3.485	4	1.189	0.869	3.052
USE3	3.388	4	1.143	0.884	3.572
USE4	3.495	4	1.214	0.896	3.917
USE5	3.427	4	1.259	0.879	3.35
USE6	3.777	4	1.14	0.795	1.874
Perceived Ease of Implementation					
EASE1	4.301	5	0.912	0.818	2.409
EASE2	4.019	4	1.005	0.836	2.716
EASE3	4.146	4	0.939	0.821	2.311
EASE4	4.165	4	0.966	0.84	2.637
EASE5	4.117	4	0.978	0.836	2.401
EASE6	3.951	4	0.959	0.748	2.095
Acceptance of Circular Economy Principles					
ACC1	4.563	5	0.809	0.851	3.735
ACC2	4.534	5	0.834	0.846	4.202
ACC3	4.505	5	0.902	0.862	3.204
ACC4	4.592	5	0.886	0.835	3.172
ACC5	4.573	5	0.866	0.912	4.96
ACC6	4.524	5	0.891	0.783	2.742
ACC7	4.534	5	0.798	0.849	3.882

Table 4
Reliability test.

Variable	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
RED	0.883	0.889	0.915	0.683
REU	0.854	0.876	0.895	0.631
REF	0.713	0.712	0.840	0.638
REP	0.848	0.888	0.889	0.616
REC	0.773	0.816	0.840	0.515
USE	0.931	0.934	0.946	0.744
EASE	0.900	0.905	0.923	0.668
ACC	0.935	0.937	0.948	0.721

model. This process is continued until there are sufficient random subsamples. The structural model created using the bootstrap procedure is shown in Fig. 2, where the asymptotic significance (p-value) values are displayed on the relationships between the latent variables. From the p-value scores (Table 9), it can be observed that five out of seven hypotheses are validated, with the p-value exceeding the maximum allowable significance level of 0.05. The hypotheses are validated and rejected as follows:

The results suggest that an organization's commitment to reducing the use of non-renewable resources (H1), to reusing systems and practices, and to recycling (H5) leads to enhanced perceptions of the usefulness of the CE principles in the eyes of its employees. Additionally, the employees' perceptions of the usefulness of these principles lead employees to believe more firmly that they can be implemented in their organization's structures and processes (H6) and, in turn, this stronger belief increases the acceptability of these principles (H7).

However, two hypotheses were rejected. In particular, an organization's commitment to refurbishing (i.e., collecting discarded products or materials that can be refinished and sanitized to serve their original functions) (H3) and an organization's commitment to repairing products and materials (to extend their life-cycle) do not necessarily increase perceptions of usefulness of the CE principles in the eyes of employees (H4).

4.2. fsQCA

Our study identifies three probable models based on the possible outcomes that could occur. Multiple combinations of causal conditions are identified and considered sufficient for the expected outcomes. It is common knowledge that "[f]or a configuration to be considered sufficient, the consistency measure should exceed a minimum threshold of 0.75" (Woodside, 2014). This can be assessed by analysing the consistency and coverage scores on fuzzy-set XY plots for each of the three outcomes, tests that reveal that the five antecedent conditions are sufficient for the expected outcome.

For Model 1 Antecedents (5R) → Outcome (Usefulness), the consistency score of 0.914334 with a coverage score of 0.60664 implies that the distribution of fuzzy sets is highly consistent with the assumption that Antecedent 5R is a subset of the outcome - USE, and the newly created variable 5R covers 60,66 % of the outcome.

For Model 2 Antecedents (5R) → Outcome (Ease of implementing), the consistency score of 0.898219 with a coverage score of 0.610375 implies that the distribution of fuzzy sets is highly consistent with the assumption that Antecedent 5R is a subset of the outcome - EASE, and the newly created variable 5R covers 61,03 % of the outcome.

For Model 3 Antecedents (5R) → Outcome (Acceptance of Circular Economy principles), the consistency score of 0.856658 with a coverage score of 0.53418 implies that the distribution of fuzzy sets is highly consistent with the assumption that Antecedent 5R is a subset of the outcome - ACC, and the newly created variable 5R covers 53,41 % of the outcome.

Although the scores of consistencies and coverage for our data suggest an important causality among the cases in this configuration, further inquiry was needed. For this, we used the truth table analysis to identify a complex solution for our three proposed models.

For model Model 1 - Antecedents (5R) → Outcome (Usefulness), the truth table depicts various case configurations, enumerating all the potential logical causal pairings between the antecedent conditions that might result in our desired outcome (Table 10).

The truth table for the negated expected outcome offers intriguing probable configurations for antecedent conditions that might be considered significant hurdles for employees to adhere to CE principles (Table 11).

Then, we used the Quine-McCluskey algorithm to find and show the intermediate, parsimonious and complex solutions for the positive and negative outcomes from the pool data. The analysis of the positive outcome, USE = f(RED, REU, REF, REP, REC), revealed two complex and two identical intermediate solutions for causal configurations of the antecedent conditions that could probably lead to the outcome, as shown in Table 12. With fsQCA, we also looked at the negated outcome ~ USE = f(RED, REU, REF, REP, REC) (Pappas et al., 2017), which tests for Low / no perceived usefulness to implement 5R - Circular Economy

Table 5
Discriminant Validity.

	ACC	EASE	REC	RED	REF	REP	REU	USE
ACC	0.849							
EASE	0.675	0.817						
REC	0.212	0.356	0.718					
RED	0.24	0.373	0.693	0.826				
REF	0.19	0.322	0.618	0.643	0.798			
REP	0.381	0.442	0.598	0.591	0.669	0.785		
REU	0.358	0.487	0.676	0.682	0.549	0.582	0.795	
USE	0.249	0.502	0.418	0.211	0.306	0.291	0.454	0.863

Table 6
R Squares.

	R Square	R Square Adjusted
ACC	0.455	0.45
EASE	0.252	0.244
USE	0.285	0.248

Table 7
Effect size (f2).

	RED	REU	REF	REP	REC	USE	EASE	ACC
RED						0.078		
REU						0.117		
REF						0.009		
REP						0.000		
REC						0.057		
USE							0.337	
EASE								0.836
ACC								

Table 8
Q Squares (Q2).

	SSO	SSE	Q^2 (=1-SSE/SSO)
RED	515	515	
REU	515	515	
REF	309	309	
REP	515	515	
REC	515	515	
USE	618	499.091	0.192
EASE	618	515.669	0.166
ACC	721	489.583	0.321

principles. This analysis showed that two parsimonious and two intermediate solutions could probably lead to the negated outcome (Table 12).

For Model 2 Antecedents (5R) → Outcome (Ease of implementation of Circular Economy principles), the truth table depicts various case configurations, enumerating all the potential logical causal pairings between the antecedent conditions that might result in our desired outcome (Table 13).

The truth table for the negated expected outcome offers intriguing probable configurations for antecedent conditions that might be viewed as significant hurdles for employees to adhere to the CE principles (Table 14).

Then, we used the Quine-McCluskey algorithm to find and show the intermediate, parsimonious and complex solutions for the positive and negative outcomes from the pool data. The analysis of the positive outcome, EASE = f(RED, REU, REF, REP, REC), revealed two complex, one parsimonious and two intermediate solutions for causal configurations of the antecedent conditions that could probably lead to the outcome, as shown in Table 15 With fsQCA, we also looked at the negated outcome ~ EASE = f(RED, REU, REF, REP, REC), which tests for Low / no perceived ease to implement 5R - Circular Economy principles. This analysis showed that two parsimonious and two intermediate solutions could probably lead to the negated outcome (Table 15).

For Model 3 Antecedents (5R) → Outcome (Acceptance of Circular Economy Principles), the truth table depicts various case configurations, enumerating all the potential logical causal pairings between the antecedent conditions that might result in our desired outcome (Table 16).

The truth table for the negated expected outcome offers intriguing probable configurations for antecedent conditions that might be viewed as significant hurdles for employees to adhere to the CE principles (Table 17).

Then, we used the Quine-McCluskey algorithm to find and show the intermediate, parsimonious and complex solutions for the positive and negative outcomes from the pool data. The analysis of the positive outcome, ACC = f(RED, REU, REF, REP, REC), revealed two complex, one parsimonious, and two intermediate solutions for causal configurations of the antecedent conditions that could probably lead to the outcome, as shown in Table 18. With fsQCA, we also looked at the negated outcome ~ ACC = f(RED, REU, REF, REP, REC), which tests for Low / no perceived acceptance of 5R - Circular Economy principles. This analysis showed that two parsimonious and two intermediate solutions could probably lead to the negated outcome (Table 18).

According to Ragin (2000), configurational reasoning is the fundamental premise of QCA. Multiple combinations of causal conditions may lead to a specific outcome in a social context, which is defined by causal complexity. This is especially important in an entrepreneurial environment where employees are motivated by different things. The primary advantage of fsQCA is its support for "equifinality" or "multiple causations," where "multiple" refers to several pathways that all lead to the same outcome.

FsQCA also accepts "conjunctural causation," which states that the presence or absence of a causal condition depends on how it interacts with one or more other causal conditions for an event to occur.

We found several possible combinations (see Table 19, 20 and 21) of the antecedent conditions that could probably lead to the three expected outcomes. We selected the combinations with consistency over 0.85 to suit the model better, and the results and coverage of the model can be expressed as follows:.

A common denominator emerges for all three expected outcomes: a combination of all the antecedent conditions that has the highest consistency and coverage for Model 1 and Model 2 but falls to second place in Model 3. What is peculiar about the third model is that the highest probable consistency that can be reached with the presented antecedent conditions is achieved when Reuse is absent from the model, meaning that employees would be highly motivated to accept the principles of Circular Economy if they are not forced to adopt reusing systems.

4.2.1. *Discussion and research implications*

This paper addresses the gaps identified in the issues of employees' perspective on the transition to CE, to better understand the predictors of employees' perspective towards this move towards sustainability. Therefore, it firms up the connection between the CE and sustainable entrepreneurship by providing both theoretical and empirical contributions to this field. The findings offer future research directions for academics and practical implications for companies, managers, and policymakers.

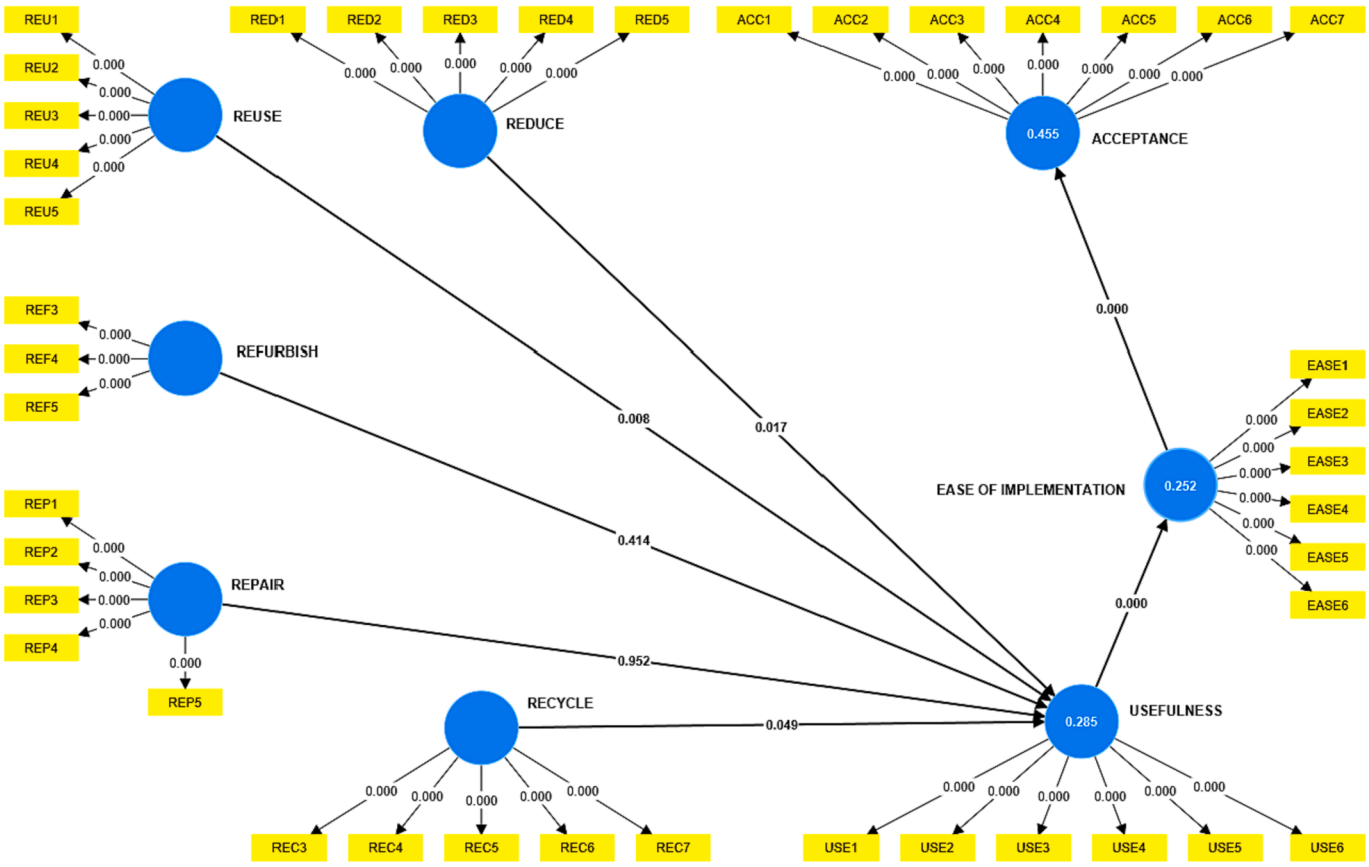

Fig. 2. Research conceptual model after bootstrapping, original contribution by the authors. Output source: Ringle, Christian M., Wende, Sven, & Becker, Jan-Michael. (2022). SmartPLS 4. Oststeinbek: SmartPLS. Retrieved from https://www.smartpls.com.

Table 9
Results of hypothesis testing.

Hypothesis		Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Value	Validation
H1	RED → USE	−0.378	−0.324	0.156	2.419	0.0170	valid
H2	REU → USE	0.437	0.405	0.159	2.755	0.0080	valid
H3	REF → USE	0.119	0.107	0.144	0.825	0.4140	rejected
H4	REP → USE	−0.008	0.009	0.141	0.059	0.9520	rejected
H5	REC → USE	0.316	0.322	0.147	2.159	0.0490	valid
H6	USE → EASE	0.502	0.498	0.084	5.941	0.0000	valid
H7	EASE → ACC	0.675	0.675	0.06	11.267	0.0000	valid

Table 10
Truth table analysis for Model 1 - Antecedents (5R) → Outcome (Usefulness).

REC	RED	REF	REP	REU	number	USE	Raw consist.	PRI consist.	SYM consist
1	1	1	1	1	46	1	0.914334	0.883908	0.922892
0	0	0	0	0	5	1	0.858254	0.670021	0.67002
0	0	0	1	0	5	1	0.823084	0.562061	0.57971

Table 11
Truth table analysis for Model 1 - Antecedents (5R) → Negated Outcome (~Usefulness).

REC	RED	REF	REP	REU	number	~USE	Raw consist.	PRI consist.	SYM consist
1	1	1	1	1	46	0	0.316582	0.073850	0.077107
0	0	0	1	0	5	0	0.760643	0.407494	0.42029
0	0	0	0	0	5	0	0.712	0.32998	0.32998

From a theoretical perspective, the current study sheds light on the influence of organizations' commitment to the five CE principles on their employees' perceptions of the usefulness, ease of implementation, and acceptability of these principles. Its originality and uniqueness consist in tackling a fresh angle of study and providing a new complementary perspective. By considering the humans, in this case, "the

Table 12
Configurations of antecedent conditions leading to high and low/no perceived usefulness to implement 5R - Circular Economy principles

Configuration	High perceived usefulness to implement 5R - Circular Economy principles				Low / no perceived usefulness to implement 5R - Circular Economy principles			
	Complex solution		Intermediate solution		Parsimonious solution		Intermediate solution	
REC	●	⊗	●	⊗	●		⊗	●
RED	●	⊗	●	⊗			⊗	●
REF	●	⊗	●	⊗		●	⊗	●
REP	●		●					●
REU	●	⊗	●	⊗	⊗	⊗	⊗	●
Consistency	0.914334	0.798141	0.91433	0.79814	0.71991	0.70715	0.65073	0.31658
Raw Coverage	0.606641	0.169105	0.60664	0.16910	0.41792	0.45238	0.30701	0.46773
Unique Coverage	0.533484	0.095948	0.53348	0.09594	0	0.00501	0.16008	0.32080
Overall solution consistency	0.878452		0.878452		0.541928		0.352507	
Overall solution coverage	0.702589		0.702589		0.783522		0.62782	

Table 13
Truth table analysis for Model 2 - Antecedents (5R) → Outcome (Ease of implementation).

REC	RED	REF	REP	REU	number	EASE	Raw consist.	PRI consist.	SYM consist
1	1	1	1	1	46	1	0.898219	0.86433	0.893629
0	0	0	0	0	5	1	0.809839	0.622889	0.636015
0	0	0	0	0	5	0	0.757995	0.545455	0.545455

Table 14
Truth table analysis for Model 2 - Antecedents (5R) → Negated Outcome (~Ease of implementation).

REC	RED	REF	REP	REU	number	~EASE	Raw consist.	PRI consist.	SYM consist
0	0	0	0	0	5	0	0.709594	0.454546	0.363985
0	0	0	1	0	5	0	0.675497	0.356473	0.363985
1	1	1	1	1	46	0	0.326972	0.102883	0.106371

Table 15
Configurations of antecedent conditions leading to high and low/no perceived Ease of implementation of Circular Economy principles.

Configuration	High perceived ease to implement 5R - Circular Economy principles					Low / no perceived ease to implement 5R - Circular Economy principles			
	Complex solution		Parsimonious solution	Intermediate solution		Parsimonious solution		Intermediate solution	
REC	●	⊗		●	⊗			⊗	●
RED	●	⊗		●	⊗	●		⊗	●
REF	●	⊗		●	⊗		●	⊗	●
REP	●	●	●	●	●			●	●
REU	●	⊗		●	⊗	⊗	⊗	⊗	●
Consistency	0.8982	0.80983	0.80348	0.89821	0.80983	0.76681	0,760,529	0.67549	0.32697
Raw Coverage	0.6103	0.12334	0.811814	0.61037	0.12334	0.42083	0.46220	0.21250	0.45893
Unique Coverage	0.5386	0.05184	0.811814	0.53861	0.05184	0	0.00565	0.08005	0.32648
Overall solution consistency	0.877387		0.80348	0.877387		0.549946		0.345875	
Overall solution coverage	0.661959		0.811814	0.661959		0.75536		0.53899	

Table 16
Truth table analysis for Model 3 - Antecedents (5R) → Outcome (Acceptance of Circular Economy principles).

REC	RED	REF	REP	REU	number	ACC	Raw consist.	PRI consist.	SYM consist
1	1	1	1	1	46	1	0.856658	0.826042	0.850556
0	0	0	1	0	5	1	0.806055	0.69403	0.718701
0	0	0	0	0	5	0	0.730337	0.609512	0.609512

employees", as the main focus, it differs from other works that have examined the link between SE and the CE but have not been oriented towards the workforce.

From a methodological perspective, this work's use of a mixed quantitative and qualitative approach offers a more comprehensive understanding of circular entrepreneurship according to employees' perceptions. According to the PLS-SEM findings, three of the first five hypotheses were confirmed, i.e., in general, an organization's commitment to the CE principles increases the probability of its employees perceiving these principles as useful. In particular, hypothesis 1 was confirmed by our research, which suggests that employees have an enhanced perception of the usefulness of the CE principles when their organization reduces the use of non-renewable resources. This is in line with the CE literature regarding the 'Reduce' activities, one of the main

Table 17
Truth table analysis for Model 3 - Antecedents (5R) → Negated Outcome (~Acceptance of Circular Economy principles).

REC	RED	REF	REP	REU	number	~ACC	Raw consist.	PRI consist.	SYM consist
0	0	0	0	0	5	0	0.579084	0.390488	0.390488
0	0	0	1	0	5	0	0.538316	0.271642	0.281299
1	1	1	1	1	46	0	0.29559	0.145136	0.149444

Table 18
Configurations of antecedent conditions leading to high and low/no perceived Acceptance of Circular Economy Principles.

Configuration	High perceived acceptance of 5R - Circular Economy principles					Low / no perceived acceptance of 5R - Circular Economy principles			
	Complex solution		Parsimonious solution	Intermediate solution		Parsimonious solution		Intermediate solution	
REC	●	⊗		●	⊗	●		⊗	●
RED	●	⊗		●	⊗		●	⊗	●
REF	●	⊗		●	⊗			⊗	●
REP	●	●	●	●	●			●	●
REU	●	⊗		●	⊗	⊗	⊗	⊗	●
Consistency	0.8566	0.80605	0.834855	0.85665	0.80605	0.60766	0.60466	0.53831	0.29559
Raw Coverage	0.5341	0.11265	0.774034	0.53418	0.11265	0.41139	0.40737	0.20789	0.50931
Unique Coverage	0.4802	0.05870	0.774034	0.48023	0.05870	0	0	0.04281	0.34380
Overall solution consistency	0.856379		0.834855	0.856379		0.396316		0.288388	
Overall solution coverage	0.592888		0.774034	0.592888		0.668246		0.551696	

Table 19
Necessary conditions for Model 1 - Antecedents (5R) → Outcome (Usefulness).

Conditions tested	Consistency	Coverage
REC●RED●REF●REP●REU	0.914334	0.606640
REC●REF●REP●REU	0.913403	0.636607
RED●REF●REP●REU	0.904310	0.643500
REC●RED●REF●REU	0.901.530	0.629354
REC●RED●REF●REP	0.901105.	0.619161
REF●REP●REU	0.901074	0.684299

Table 20
Necessary conditions for Model 2 - Antecedents (5R) → Outcome (Ease of implementation of Circular Economy principles).

Conditions tested	Consistency	Coverage
REC●RED●REF●REP●REU	0.898219	0.610375
RED●REF●REP●REU	0.889887	0.648559
REC●REF●REP●REU	0.886758	0.632997
REC●RED●REP●REU	0.886318	0.640346
REC●RED●REF●REU	0.884213	0.632709
REC●RED●REF●REP	0.883292	0.624614
RED●REF●REU	0.877229	0.673343
REC●REF●REU	0.872938	0.663256

Table 21
Necessary conditions for Model 3 - Antecedents (5R) → Outcome (Acceptance of Circular Economy principles).

Conditions tested	Consistency	Coverage
REC●RED●REF●REP	0.857289	0.553617
REC●RED●REF●REP●REU	0.856658	0.566442
REC●RED●REP●REU	0.854408	0.566442
REC●RED●REP	0.853640	0.593812
RED●REP●REU	0.850940	0.616687
REC●RED●REF●REU	0.850584	0.558509

actions taken by companies in their operations (Jabbour et al., 2019; Pieroni et al., 2019; Witjes & Lozano, 2016).

We contribute to this body of literature by offering an employee perspective that demonstrates that when the CE is studied at the meso level (the company), it appears that workers should be embedded in discussions about sustainable business practices. For a successful circular strategy, organizations and managers need to motivate and engage their employees in this transition to a CE. In addition, in line with the literature, employees should be seen as catalysts and facilitators who are expected to participate in formulating the company's goals. In doing so, managers and decision-makers should identify internal leaders who can engage and play as "catalysts" and "federators" to ensure the effective and shared implementation of a circular economy by all stakeholders.

Hypothesis 2 was confirmed, i.e., an organization's commitment to reuse systems and practices enhances its employees' perceptions of the usefulness of the principles of CE. Employees contribute to the implementation of such reuse systems by adopting sustainable behaviours and can, therefore, be considered key drivers for putting the CE principles into practice in the daily life of an organization (Marrucci et al., 2022).

Our results also confirmed Hypothesis 5, according to which an organization's commitment to recycling enhances its employees' perceptions of the usefulness of the CE principles. This finding is unsurprising as recycling is one of the oldest and most established sustainability principles. Employees acknowledge their organization's recycling policies and practices and view them as beneficial to a transition towards a CE.

Although three of the hypotheses relating to the perceived usefulness of the 5Rs were confirmed, two were not. In particular, the respondents did not find the proposed CE principles of refurbishing and repairing useful and, therefore, rejected these ideas. This might suggest that the original 3R conceptualization already sufficiently represents the most crucial ideas of the CE, whereas employees view the two added principles as less relevant. The current focus seems to be primarily on an organization's energy and material input and less on the production process itself. However, both refurbishing (defined as collecting discarded products or materials that can be refinished and sanitized to serve their original functions) and repairing (to extend the life cycle of products and materials), also make substantial contributions to the realization of a CE. As the two added CE principles still appear to be conceptually pertinent, we encourage future research to examine further their role in the realization of CE principles.

In the outcome framework of our conceptual model, both hypotheses 6 and 7 were also confirmed. Therefore, the results suggest that when employees perceive the usefulness of CE principles, they are more likely

to believe they can be implemented easily in their organization's structures and processes, and, in turn, this latter belief increases the likelihood that they will accept these principles. Overall, the conceptual model was confirmed, except for the perceived usefulness of refurbishing and repairing.

Our findings also have practical implications. First, organizations should commit to the principles of the CE and have transparent internal communication about these endeavours. If they do so, their employees have a stronger perception of the usefulness of these principles. This especially applied to the three Rs: reduce, reuse, and recycle. The two added dimensions, refurbish and repair, may not be relevant (yet). Second, when organizations manage to persuade their employees of the usefulness of the CE principles, it may become easier to implement these principles in their structures and processes. Third, as a result, acceptance of the CE principles by employees, in general, can be increased by proactively implementing them in the organization's policies and practices.

The fsQCA findings identified three likely scenarios. Several sets of antecedents can be singled out as necessary for the occurrence of the target consequences. We identified several permutations among the causal factors that might account for each of the three predicted results. All three projections converge on a similar denominator: a set of preconditions that is most reliable and comprehensive in Models 1 and 2 but only second-best in Model 3. The third model is unique because it is the most consistent without reuse, indicating that employees would be highly motivated to accept the CE principles if they were not coerced into adopting reuse systems.

Therefore, the results of the two methodologies lead to distinct conclusions. Whereas the PLS-SEM results suggest organizations should focus on reducing, reusing, and recycling, not on refurbish and repair, the fsQCA results stress reduce, refurbish, repair, recycle, but not reuse. Due to the differentiated recommendations, we recommend future research revisit the 5R conceptualization and the impacts of the five dimensions on employee perception and acceptance by using larger samples and adopting further methodologies. The fsQCA findings slightly relativize the practical implications mentioned above. Refurbish and repair do not show diminished relevance according to the second methodology. Therefore, we recommend including all 5Rs in organizations' endeavours towards a transition to the CE.

5. Conclusion

This study examined how an organization's commitment to CE principles affects employees' willingness and ability to implement them and how this impacts successful circular economy initiatives. We also investigated three possible outcomes that may enhance the possibility that employees would commit to embracing change processes aimed towards sustainability. Furthermore, we examined three potential scenarios that could increase the likelihood of employees actively adopting change initiatives focused on sustainability, thereby mitigating the effects of present and future shifts in paradigms. To pursue this goal, we used a mixed-method approach (PLS-SEM and fsQCA) and the 5R framework (Reduce, Reuse, Refurbish, Repair, Recycle) with an adapted TAM.

The findings show that an organization's commitment to reducing the use of non-renewable resources, to adopting reuse systems and practices and to recycling positively influences its employees' perceptions of the usefulness of the CE principles. Additionally, when employees perceive the CE principles as useful, this increases their belief that they can be easily implemented in their organization's structures and processes, and this, in turn, increases the likelihood that they will accept these principles. In contrast, we did not find support for two hypotheses: An organization's commitment to refurbishing (i.e., collecting discarded products or materials that can be refinished and sanitized to serve their original functions) and an organization's commitment to repairing products and materials (to extend their lifecycle) do not seem to increase its employee's perceptions of the usefulness of the principles of CE.

Our findings also imply that employees are more willing to embrace CE principles or sustainable business model developments if they can foresee a beneficial impact on the organization's sustainability. In the long run, legislators, regional and local administrations, and management's sustainability vision are needed more than employees. These stakeholders are essential to implementing CE principles and sustainable business strategies. Policymakers must provide favourable legislation and incentives, while regional and local governments can offer infrastructure and resources. Specific targets need to be set, and CE principles integrated into the corporate strategy, to promote sustainability in line with management's strategic vision.

As with all research, our study has several limitations. First, in line with the exploratory approach, the sample size (103 respondents) was somewhat small. While we compensated somewhat for this by using a bold methodological approach to get robust results, we encourage future researchers to work with larger samples. Second, our sample was dispersed across many sectors, and sector-specific examinations can provide more detailed insight. Third, our research has a European bias. Because other cultures are likely to provide different results, we encourage future research that broadens the sample's cultural variety. In particular, a comparison with Asian firms would be insightful in future research. Since sustainable entrepreneurship is a socially constructed phenomenon, it follows that there are social situations that place greater expectations and constraints on the entrepreneurial context than others; future research should investigate these more nuanced and varied contexts.

CRediT authorship contribution statement

George Bogdan Dragan: Writing – review & editing, Writing – original draft, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Wissal Ben Arfi:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Victor Tiberius:** Writing – review & editing, Writing – original draft, Validation, Investigation, Formal analysis, Data curation, Conceptualization. **Aymen Ammari:** Writing – review & editing, Writing – original draft, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marcos Ferasso:** Writing – review & editing, Writing – original draft, Validation, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. . Main constructs used in the conceptual model

Acronym and Variable description	
Independent variable / Antecedent condition - Reduce	
RED1	reducing greenhouse gas emissions
RED2	reducing ecological footprint
RED3	reducing the use of traditional energy sources
RED4	reducing the use of plastic
RED5	reducing fuel consumption
Independent variable / Antecedent condition - Reuse	
REU1	reuse and refill over single-use solutions
REU2	reusable cups, containers, and take-away bottles
REU3	support policy frameworks for reuse systems
REU4	business partners that commit to reuse systems
REU5	support for consumers to make informed choices on reuse
Independent variable / Antecedent condition - Refurbish	
REF1	improving workplace ergonomy
REF2	refurbish existing equipment and technology
REF3	use of eco-friendly lighting
REF4	use of eco-friendly building climatisation
REF5	use of solar panels
Independent variable / Antecedent condition - Repair	
REP1	contracting service companies
REP2	corrective maintenance
REP3	preventive maintenance
REP4	risk-based maintenance
REP5	condition-based maintenance
Independent variable / Antecedent condition - Recycle	
REC1	collecting waste
REC2	waste separation
REC3	remanufacturing
REC4	donating resources no longer useful
REC5	own recycling programme
REC6	external recycling providers
REC7	e-waste recycling
Dependent variable / Outcome 1 - Perceived usefulness of implementing CE principles into the organizational environment	
USE1	accomplish task easier
USE2	improving job performance
USE3	increase in productivity
USE4	enhancing job effectiveness
USE5	easing the job
USE6	useful for job specificity
Dependent variable / Outcome 2 - Ease of implementing CE principles into the existing business model	
EASE1	ease of learning CE principles
EASE2	ease of implementing CE principles
EASE3	clear engagement for CE principles
EASE4	clarity in understanding of CE principles
EASE5	Skill in using CE principles
EASE6	easy application of CE principles
Dependent variable / Outcome 3 - Acceptance of CE principles to be embedded into the current business environment	
ACC1	reducing is beneficial for the economy and environment
ACC2	reusing systems are beneficial for the economy and environment
ACC3	refurbishing is beneficial for the economy and environment
ACC4	repairing is beneficial for the economy and environment
ACC5	recycling is beneficial for the economy and environment
ACC6	need for clear organizational CE policies
ACC7	organizational engagement in CE practices

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