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**A REVIEW OF CIRCULARITY INDICATORS AND PSYCHOLOGICAL FACTORS: A COMPREHENSIVE ANALYSIS OF CIRCULARITY PRACTICES IN ORGANIZATIONS****Andreea Loredana Birgovan**

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**Introduction.** In a booming global economy of finite resources, pandemics, armed conflict and irresponsible over-consumption, attention to the nature of finite resources becomes imperative. The transition to a circular economic model lies at the intersection of economic development and environmental protection needs, significantly impacting today's society and future generations. Research and understanding of the circular economy are catalysts for accelerating processes to change the current unsustainable paradigm. This study reviews the literature and identifies how circularity indicators are addressed at the organisational level.

**Aim and tasks.** The study aims to review and synthesise the literature on micro-level circular indicators, psychological factors, and relevant theories in the context of organisational performance, as well as identify knowledge gaps and ways the two elements can be integrated into the circularity assessment.

**Results.** The study shows no universally accepted method to measure the circular economy at the organisational level. Most indicators focus only on the environment, ignoring the social dimension, while many indicators in the literature are not standardized and cannot be compared. It has also been identified that the social component needs to be better represented, with all the attention focused on the environment. Within the social component, organisational psychology (organisational culture, satisfaction, attitudes, leadership, motivation, and employee well-being) is almost not represented in the studies and indicators, as they are highly relevant to the social component.

**Conclusions.** This systematic review provides an overview of existing indicators and measurement tools at the organisational level. Following the analysis and results presented above, it can be said that although underexplored, the social dimension of the circular economy has begun to attract attention in the literature. The present research highlights the relevance of the social aspect in the circular economy and suggests that it has been undervalued in research to date. Irrespective of the specific areas of interest of different studies, there is a growing need for a more comprehensive understanding of the social impact of the circular economy, which would include all aspects of social life, from jobs and education to civic engagement and behaviour change.

**Keywords:** circular economy, organizational psychology, circular indicators, social impact, environment.

## **1. Introduction.**

The circular economy in organizations has emerged because of the rapid depletion of virgin resources, increasing environmental degradation, and putting constant pressure on businesses to change the traditional linear model of the economy. In recent years, this concept has become increasingly prominent, being promoted as a solution to environmental challenges and a way to achieve sustainable development. Not only to reduce the negative environmental impact of the current business model through better resource management and waste reduction but implementing the paradigm also comes with economic growth and social welfare.

In the current context of climate change and environmental degradation, the circular economy has become increasingly important. Through the circular economy, organizations that adopt circular practices can optimize their resources, minimize waste and be sustainable and socially responsible. Although several researchers have highlighted the benefits of implementing a circular economy at the organizational level, change is not easy and often, like any change, can be influenced by psychological factors such as attitudes, behaviours, and motivation. To make change stick, it is crucial to understand all the factors involved especially psychological ones that have been neglected in the literature. Until now, the focus has been almost entirely on the environmental and economic components, and there have been numerous studies in this direction. In contrast, the social component, the elements of organizational psychology, have been neglected.

Studies that have looked primarily at the performance of organizations and tried to understand the factors that contribute to it have consistently identified psychological factors and their implications as a critical element (Hoffman, & Bazerman, 2007; Manuti, & Giancaspro, 2019; Rosen, & Di Fabio, 2023). Thus, in the study of organizational performance, some studies address the link between performance and psychological factors, but these factors are separate from circularity.

A concept has been identified in the literature that addresses, in one way or another, the social side or social sustainability.

It involves incorporating social aspects into the design, implementation and evaluation of sustainability strategies (Vallance et al., 2011). These factors include equity, justice and social inclusion, which, according to Schaltegger & Burritt (2002), aim to ensure that sustainability's benefits are fairly distributed in society (Burritt et al., 2022). More specifically, social sustainability ensures, for example, that implementing the circular economy does not have a negative social impact, such as loss of jobs or lower quality of life (Ghisellini et al., 2016; Bercea et al., 2019).

On the other hand, social sustainability needs to capture the multitude of social factors that can contribute to the implementation of the circular economy. In this context, attitudes, values, norms, and underlying assumptions of members of an organization can predict whether or not they intend to do behaviour.

To be able to talk about change, about proactivity towards a circular economy at the organizational level, there is a need first to understand the social impact and the psychological factors that support change and can develop specific interventions to change the current paradigm.

Given these issues, this review aims to fill this gap in the literature by providing a comprehensive review of existing literature that has studied these concepts separately or together.

Organizations are beginning to want to transition from the classic linear economy to a circular one, so it becomes vital to measure this progress as accurately as possible to achieve this goal. These organizations bring together to add value by developing strategies regarding the efficiency of resource consumption through approaches such as repair, remanufacturing or capitalization of the economic and environmental value included in the products (Bîrgovan et al., 2021; Pacurariu et al., 2021).

There are currently many studies focusing on the development of different indicators and measurement tools. This large volume of information can be overwhelming for organizations when choosing the optimal method and can also be challenging for consultants. To shed light on this area, and will highlight the social component of the circular economy by reviewing the tools developed so far.

## **2. Objectives.**

More and more pressure has been put on businesses in recent years to transition to a circular economy and manage resources more sustainably. In recent years, events such as the COVID-19 pandemic and the conflict between Russia and Ukraine have shown the world how important it is to manage resources responsibly and what happens when they become scarce, as in the crises the world has been exposed to. Can humanity do something to sustain the planet so that sufficient resources are available for current and future generations? Recently, this issue has been increasingly studied. Integrating the circular economy at the macro, meso, and micro levels can contribute to this.

Several actions have emerged to implement circular economy principles within organisations.

Thus, in order to measure the progress and performance of the implemented methods, there is a need for measurement tools that can capture progress as accurately as possible and facilitate the identification of weaknesses or strengths in implementation. According to Saidani et al. (2017) studied, it is essential to establish the present situation of the circularity level to have a benchmark to track progress or areas where intervention is needed (Saidani et al., 2019). Many researchers, recognising the importance of measurement tools, have had various attempts to create, just in a rather inconsistent manner, if there is a reference to their purpose and approach. Saidani et al. (2019) highlighted the need for specialists to develop reliable and valid evaluation tools to measure circular performance accurately. These tools would not only measure an organisation's progress towards circularity. However, tools would also help identify critical factors that could facilitate or hinder this journey, helping to develop strategies and interventions (Saidani et al., 2019).

The European Commission has repeatedly stressed the importance of measurement systems and has created a set of indicators in the 2015 Action Plan (European Commission, 2015) for the macro level. Despite these attempts, currently, there is no standardisation of circular performance measurement tools at the EU level.

This is quite complex and difficult, given the diversity of existing organisations, the different understanding of certain terms within the circular economy and the complexity that researchers face. Thousands of indicators have been developed to measure circularity at micro, meso and macro levels. The different approaches of researchers have been diverse, and the tools developed have tried to measure different parts, with a focus on products or processes in most cases.

Thus, numerous measurement tools are available in the literature, as analysed by various researchers in reviews on the subject (CTI Tool, CircularTrans, Inedit, Circulytics, CIRCelligence, etc.). The measurement tools developed so far have yet to consider several essential factors in achieving the circular economy, namely the human factor. As a result, they need to pay more attention to the psychological factors that play a crucial role in the transition to a circular economy. This theoretical review attempts to fill this gap in the literature by integrating these elements into a comprehensive measurement framework.

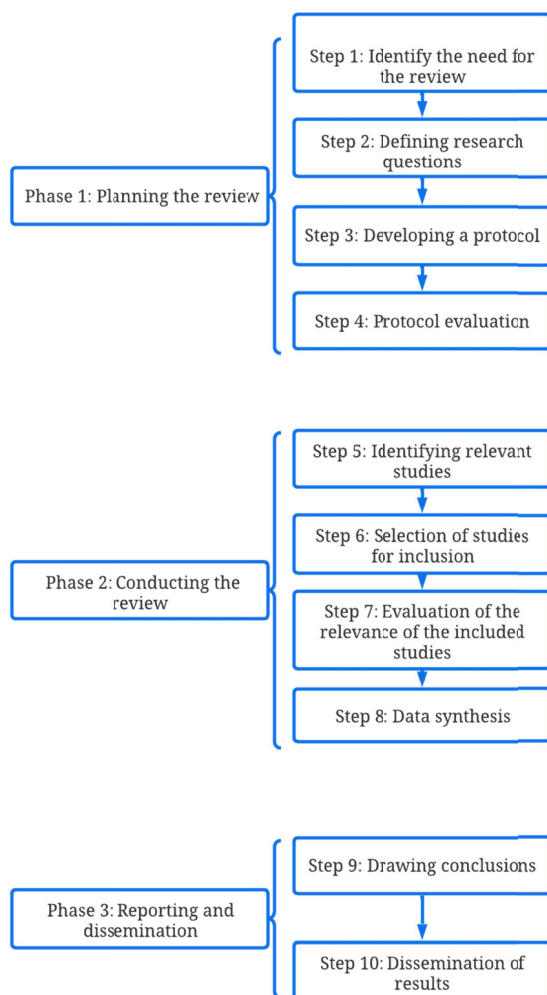
The main objective of the research was to review and synthesise the literature on micro-level circular indicators, psychological factors, and relevant theories in the context of organisational performance, as well as identify knowledge gaps and ways in which the two elements can be integrated into the assessment of circularity.

## **3. Methodology.**

Systematic review is a structured method by which researchers can identify, select, evaluate and synthesize all relevant empirical data that answer a particular research question (Higgins et al., 2011). This form of systematic research involves developing a predefined plan describing the methods and procedures for conducting the review as precisely as possible. It provides a rigorous analysis model in which the research objectives, search strategy, exclusion and inclusion criteria are clearly defined. It implies a transparent and replicable methodology, allowing a comprehensive assessment of the current state of knowledge for a given research topic.

The analysis consisted of: (1) research papers published in English from 2010 to 2023; (2) subjects related to circular economy indicators, circular organizations, organizational performance and psychological factors; (3) the influence of psychological factors on the adoption of a circular economy by organizations.

This review aimed to identify and synthesize the literature on circularity indicators in organizations and explore the relevant psychological factors and their interaction. In doing so, the aim is to provide a basis for developing more comprehensive measurement tools (Fig. 1).



**Fig. 1. Stages of systematic review.**  
Source: adapted from Kitchenham (2004).

Then, the selection process for the articles was made (Fig. 2). This is a crucial step, as it is here that the articles to be included in the final analysis are chosen. In order to carry out the selection, several steps were followed in this case. To provide an outline of how the scientific community has developed circularity indicators for organisations and how psychological factors have or have not been studied in the circular economy paradigm, a first identification stage in which keywords in the Web of Science search engine were used: circular economy, circular indicators, circular organisations, organisational performance and psychological factors. These keyword searches were applied to title, abstract and keywords.

This first screening resulted in approximately 17.046 scientific papers. In addition to these Web of Science papers, 7 strategic papers were added and identified from other sources. Following these results, several criteria were applied, and as a result, articles were excluded:

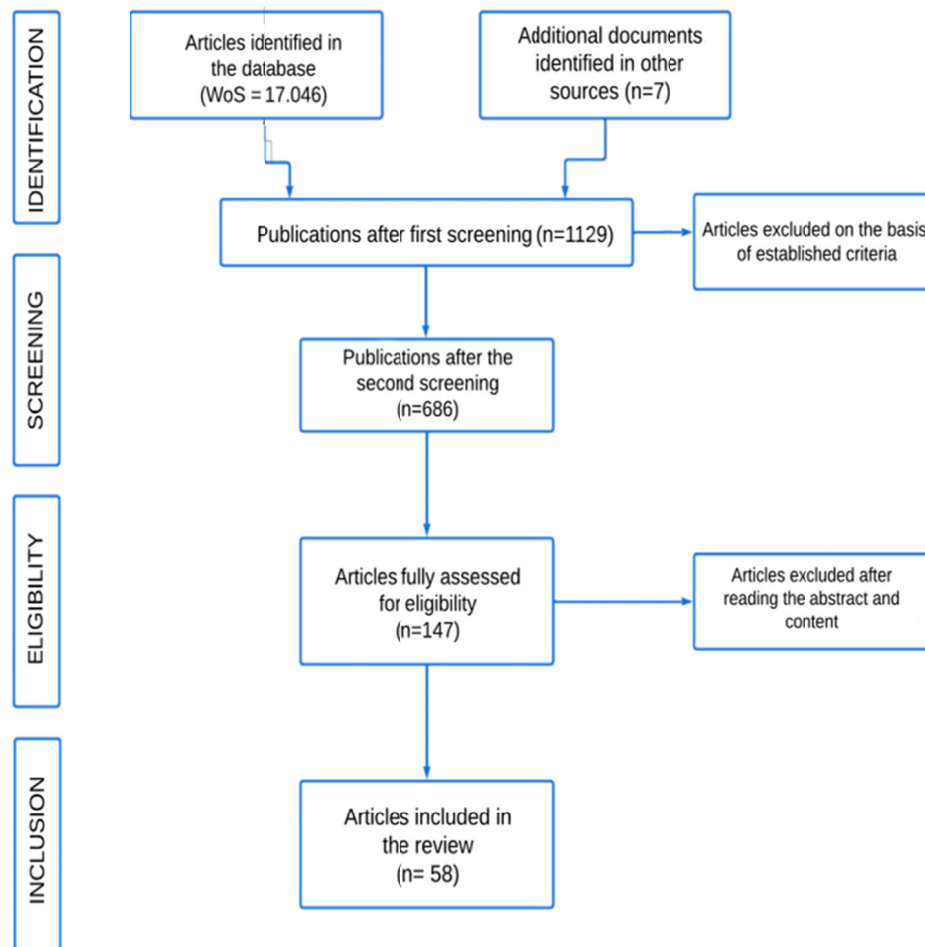
- Were published before 2010.
- Which did not address the micro level (organisations).
- Were not published in English.
- Were not relevant to the proposed objectives.

-Had incomplete data or methodology.

After using these criteria, another screening process was carried out, in which the titles and abstracts of the remaining articles were analysed. Specifically, of the 1129 articles identified in the first screening, only 686 were considered representative. The articles were checked by reading their abstracts and content in the next eligibility stage.

Therefore, at this stage, research that did not directly address the measurement of circular organisations or showed high similarity to other selected articles was eliminated, resulting in 147 articles. In the final inclusion stage, only those that added value to our study and had relevance to the proposed research question were selected for analysis.

Thus, the final sample of studies from these stages consisted of 58 articles.



**Fig. 2. Study selection process.**

#### 4. Results.

The growing circular economy economic model aims to promote sustainable development by extending the use of resources and materials. Bjørn and Hauschild (2017) note that although the circular economy has become a subject of extensive research and a framework gaining increasing recognition in society, there is a methodological discrepancy in the interpretation and application of the concept. This impacts the accurate assessment of the effectiveness of circular economy approaches and the evaluation of progress.

A review of the relevant literature over the last decade reveals a considerable increase in circular economy (CE) studies at the organisational level. In the context of the European Union, although a set of standardised indicators exists for assessment at the territorial level (Eurostat, 2021), a similar set specifically adapted for organisations has yet to be defined.

A wide variety of circular economy indicators have been proposed and examined in public and private initiatives and the speciality literature, but they need a standardised and comprehensive measurement tool. There is no unanimously accepted method of measuring the circular economy at a micro level.

As the circular economy is a means to achieve sustainable development, it is essential to consider how the indicators developed relate to the three dimensions of the circular economy (economic, environmental and social). Analysing the data in the present study, it was observed that the indicators were predominantly focused on environmental and economic aspects, with significantly less attention paid to the social component. This unbalanced approach to the circular economy, which prioritises economic dimensions at the expense of social impacts, can result in uneven results when companies try to implement circular economy practices.

It is, therefore, important to adopt a holistic approach that considers all three dimensions of sustainability equally when designing and implementing circular economy initiatives. Through such an approach, organisations can make a real positive impact on society. There was a tendency not to pay enough attention to the social component, which led to several limitations in measuring circular progress. Aspects of the social dimension, which transcend economic and environmental parameters, must be fully represented in current indicators and tools for measuring circular performance. The social component has several layers, including quality of life, number of jobs, education, organisational culture, and employee motivation.

Calzolari et al. (2022) and De Oliveira et al. (2021) have significantly contributed to the identification and analysis of many circularity indicators. De Pascale et al. (2021) and Franco & Groesser (2021), has strengthened these contributions by further identifying and classifying circular economy indicators within the structure of circular economy core principles and 3R strategies.

Analyses by Kristensen and Remmen (2019), Moraga et al. (2019) and Saidani et al. (2019) have provided insight into the variety and applicability of circularity indicators, including developing a tool that facilitates the selection of appropriate indicators.

Vinante et al. (2021) and Sassanelli et al. (2019) also provided an in-depth assessment of circular economy assessment methods and identified hundreds of indicators (365) related to the circular value chain framework.

Thus, recent research has greatly helped to understand and analyse the potential of circular economy indicators at the organisational level. However, there is still a need to standardise and adapt these tools to better meet the necessity of organisations in the context of the circular economy. Indicators and measurement tools have been used in recent years. The need to be able to check the progress of developing indicators has grown increasingly. One of the most popular tools is the Life Cycle Assessment (LCA), which provides a comprehensive picture of the environmental impacts of a product or service associated with each stage of the service life cycle or product (Guinee, 2022).

Material flow analysis (MFA) is another commonly used methodology. It is a systematic method of evaluating material flows and inventories in a spatially and temporally defined system. Therefore, this type of measurement aims to find out how and where materials are used and where and in what form they are disposed of. In this way, the flow can be quantified (kg, tons) using this tool. Depending on this, it is possible to see where action can be taken. With this tool, evaluating and seeing where interventions can be made to close the loop and reduce the negative environmental impact becomes possible.

Studies by Padilla-Rivera et al. (2020) and Mies & Gold (2021) highlighted that research on the social aspects of the circular economy has been minimal. Research has focused on job creation, employment impacts, health and well-being, education and training, consumer health and safety, poverty reduction, food security and governance without considering the psychological component (Niewczas-Dobrowolska and Górka-Chowaniec, 2023).

Psychological factors can influence the successful implementation of circularity indicators. Thus, motivation, commitment, leadership, and employee well-being, for example, can support the application of circular economy practices. The contribution of psychological factors has been unexplored in their relationship to shaping circular organisations and supporting achieving their performance goals. As some studies have shown, implementing circular principles in organisations can be challenging, as many barriers exist. However, psychological factors can influence it, and it is crucial to be able to identify them and make use of the theories that have explained them in order to be able to use them in facilitating the transition to a greener economy.

Thus, mainly in the studies reviewed in this analysis, it was identified that indicators adapted from the 2015 EU Action Plan were used. That focus is more flexible or more rigid in implementation. Each of these, therefore, includes a different set of indicators, with very few trying to be as comprehensive as possible and captures all three dimensions: social, environmental, and economic.

Great diversity and a need for more standardisation make comparison difficult. The greatest need is to have generally valid and applicable tools to influence an increased number of organisations, thus accelerating the transition sustainably. An additional finding was that although many indicators and tools have been developed at the micro level, there is very little explicit information or research on their use in practice, an issue also identified by other researchers (Stewart & Niero, 2018; Kristensen & Remmen, 2019).

One of the studies relevant to this topic found that, of the sample analysed, around three-quarters of organisations opted to adopt and adapt their measurement frameworks to evaluate circular processes. Only a quarter chose to rely on measurement frameworks proposed by researchers, consultancy firms or academic institutions (WBCSD, 2018). Other research has highlighted the tendency to neglect or bypass the practical application of indicators proposed in the literature.

**Table 1. Circular performance measuring instruments.**

	<b>Name</b>	<b>Year</b>	<b>Developer</b>
1.	Carbon footprint	2004	(WBCSD, 2004)
2.	Environmental life cycle assessment	2006	(ISO 14040:2006)
3.	Life cycle costing	2008	(Hunkeler et al., 2008)
4.	Product environmental footprint	2013	(Kjaer et al., 2019)
5.	Circular economy toolkit	2014	(Sacco et al., 2021)
6.	Idemat	2015	(Meursing, 2015)
7.	EdTool	2016	(Inedit, 2016)
8.	Material flow analysis	2016	(Brunner & Rechberger., 2016)
9.	TECNUN	2017	(Tecnun, 2017)
10.	MCI	2015	(EMF, 2015)
11.	CircularityCheck	2018	(Ecopreneur, 2018)
12.	ACODEA	2018	(ACODEA, 2018)
13.	Ecological footprint	2019	(Wackernagel & Beyers, 2019)
14.	CTI	2020	(WBCSD, 2020)
15.	CEEI	2020	(CEEI, 2020)
16.	CircularTRANS	2020	(Mondragon University, 2020)
17.	Inedit	2020	(INEDIT, 2020)
18.	CIRCelligence	2020	(Boston Consulting Group, 2020)
19.	Circulytics	2015	(Ellen MacArthur Foundation, 2015)
20.	PCDS	2020	(PCDS, 2020)
21.	Circular Economy Playbook	2020	(CEP, 2020)
22.	Social Life cycle assessment	2020	(UNEP, 2020)
23.	ready2LOOP	2021	(Technical University of Denmark, 2021)
24.	CM-FLAT	2021	(Sacco et al., 2021)
25.	KATChE	2017	(Celades et al., 2017)
26.	Circularity Calculator	2021	(Ellen MacArthur Foundation, 2021)

## 5. Conclusions.

As highlighted in this study, researchers have been particularly focused on exploring and measuring the economic and environmental components when developing more complex indicators or tools to measure the circular economy at the micro level. Aspects that have yet to be considered are the organisational psychological factors that fall under the label of the social component. Concepts such as organisational culture, job satisfaction, employee well-being, motivation, leadership style, attitudes, or other elements in this sphere, which are relevant in the transition of organisations, can provide us with directions to overcome bottlenecks that may arise at the individual level, such as resistance to change by employees.

Therefore, several gaps in the social component were identified in this study. Concerning the concepts from organisational psychology exposed, only the term social sustainability has been previously identified. There is a need to develop theoretical frameworks that address the social component in at least as complex a way as the environmental and economic components. This overview opens the door to studying and interweaving the circular economy with organisational psychology to develop both comprehensive measurement tools and solutions tailored to the needs of people in organisations who need assistance in transitioning from the linear economy.

Through this study, there needs to be more understanding of psychological factors in the circular economy literature. Their role must still be explored in organisational performance or circular economy implementation. For future studies, it would be helpful to explore factors such as organisational culture and how it impacts the organisation, leadership style and how it can facilitate or block the transition, employee motivation, job satisfaction, eco-anxiety, eco-depression, well-being and factors that could be critical elements in the process.

This systematic review provides an overview of existing indicators and measurement tools at the organisational level.

Besides these aspects, circular indicators can be criticised for lacking scientific basis and transparency. Due to the lack of standardisation, assessing the difference between indicators with similar labelling becomes difficult. Future research should standardise indicator categories to provide sufficient quality, openness, adherence to results, and reliability to remedy this predicament.

Following the analysis and the results presented above, although little studied, the social component of the circular economy is beginning to attract attention in the literature. Moreover, it is indispensable to create a positive social impact.

The results highlighted in the study can be used cross-disciplinarily and can work as a foundation for developing new public policies and supporting their implementation through different programs.

This research clearly emphasises the importance of the social aspect in the circular economy and suggests that it has been undervalued in research to date. Irrespective of the specific areas of interest of different studies, there is a growing need for a more inclusive understanding of the social impact of the circular economy, which would include all aspects of social life, from jobs and education to civic engagement and behaviour change. Further research in this area would allow more accurate measurement of progress towards the circular economy and the development of more effective strategies to facilitate this transition.

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