

Evaluation of circular skills and circular mind-set of consumers with the use of it - case study in a sample of consumers in northeast Brazil compared to a sample of internal stakeholders of an industry in transition to the circular economy

Abstract

The circular economy concept has spread around the world, including Europe and Latin America. It is defined as a concept that led to a rethinking of economic and sustainable practices today and is inspired by the functioning of ecosystems and nature. It is innovation and design that are inseparable from products and systems, in the context of sustainable development. It is based on the principle of “closing the life cycle” of products, allowing a reduction in the consumption of raw materials, energy, and water. It promotes the development of new relationships between companies, which become consumers and suppliers of materials and are reincorporated into the production cycle.

Several Circular Economy goals have already been achieved in the field of research, science, and technology. Numerous studies and efforts have been performed in the scientific and technological area for searching solutions to overcome legal, regulatory, political and technological barriers posed by several institutions; among them, the pioneering Ellen Mac Arthur Foundation has been joining efforts over the years in improving the conception and operation of the circular economy, applied to industrial processes and production chains, as well as in the structuring of new technological ecosystems. For every achievement, new challenges arise for the Circular Economy, which now needs to gain the trust of managers, politicians, investors, and entrepreneurs to initiate, plan and manage the circular economy in industry and companies. Consumers present challenges that need to be overcome by offering differentiated products and services.

The objective of the work reported here was to identify mental and cultural barriers, which can generate various obstacles to the development of Circular Economy and Environmental Social Governance (ESG, such as climate change, pollution, and human resource management) issues and find ways and guidelines to resolve the problem. When investigating mentality, culture and skills for the Circular Economy, there are several possibilities to contribute to the construction of knowledge applied to the reality of companies and consumers, carrying out pilot studies in Industries with the method expressly created and oriented towards the “integrated assessment of competence”, with the objective of planning and implementing the circular economy. It is based on the identification of mental models, on psychological aspects that are in line with the transition to the Circular Economy.” This method is reported here and has been used to collect data for the author’s doctoral thesis. As a tool, the information platform was used, with FlashPlayHR® software (www.flashplayhr.com.br/#). bilingual, in Portuguese and English, and was developed with the aim of helping leaders, employees and stakeholders to better understand the complex systems developed through innovation in the Circular Economy. It is based on the assessment of mental models from linear to circular, as well as in identifying skills to operate with circular models.

The case studies presented here included an electronics recovery and recycling industry located in São Paulo – Brazil in 2022 and a group of internet users. The

Volume 16 Issue 5 - 2023

Celene Brito

UCES- Buenos Aires; I-Merci- Brazil, Salvador; Bahia, Brazil

Correspondence: Celene Brito, UCES- Buenos Aires; I-Merci- Brazil, Salvador; Bahia, Brazil, Tel: 557 1999-748068, Email Celene.recite@donaverde.com.br

Received: October 12, 2023 | **Published:** October 26, 2023

study defines circular guidelines based on mindset, generating data for systemic, tactical, and operational planning, with interaction between technology and humans. The method provided the mapping/diagnosis of each employee and the organization’s human system, defining the stages of the process “from linear to circular,” generating content for conducting systemic planning. One of the fundamental aspects of the method is to support the strategic human resources area of organizations, providing conditions for creating constructive interaction and integration with other areas of the industry to build a Systemic Corporate Governance Model., in addition to data and content for the development of circular programs and actions. The systems view becomes preponderant and fundamental for planning.

The method/software was applied to two groups of people: one more focused on circular economy in the context of an electronic recovery industry, and another more distant from circular economy concepts, formed by Internet users. The methodology applied to the electronic retrieval industry and a random group of Internet users is reported here in detail. It was possible to identify the “linear to circular” stage of the industry to achieve the circular model.

Keywords: circular skills, systemic culture in industry, mindset assessment with it-flash playhr, circular mindset, circular planning in an industry

Introduction

Circular orientation systems are driven by a strategy of regenerating natural capital, eliminating waste and pollution, and keeping products and materials in use (Ellen MacArthur Foundation). The concept

has attracted great worldwide interest due to climate issues and the global economic crisis. Europe has invested and encouraged projects and research on this concept and these principles have reached universities, research institutes and companies in several countries, including Brazil and Argentina.

The innovation of products and services, with new proposals for business models, based on a differential vision of sustainability, has become intrinsically associated with business, with the aim at generating social welfare and environmental recovery, and has become one of the main challenges of the 21st century. Therefore, to achieve the Circular Economy goals, companies and consumer goods industries are invited to re-evaluate their mindset and culture to achieve greater results in the transition towards this new economic model.

According to Stowell & Corvellec,¹ “circular solutions tend to be labour-intensive, especially with regard to repair, recycling and reverse logistics, and the technology required is still at an early stage of maturity, which adds to its lack of cost advantages”. Universities, research institutes, regulators, companies, and consumers will have to work together, changing the way they consume products and services to achieve the required changes.

The electronics equipment industry has become a crucial point regarding the circular economy transition, due to the increasingly latent scarcity of materials, the increasing amounts of waste produced and the low recovery rate in the present scenario.²

In the end-of-life (EoL) electronic sector, Brazil is undergoing an adaptation phase to circularity, with recent regulations implemented to favour collection and processing to recover value and reduce environmental impacts.³

Since the linear economy is still dominant in the production system, the persistence and maintenance of cultural and consumption habits unfavourable to the circular economy has allowed it to remain, making it increasingly crucial that innovations with circular change proposals are addressed to the industrial sector, including the interconnected ecosystems, as well as to society. The need to understand consumer mindsets was one of the reasons for the case study, associated with the e-recovery industry and Internet users/consumers.

The Circular Economy, if implemented, orients the production method towards the conservation and valorisation of natural resources and the reduction of waste, stimulating product chain closure and a continuous recycling. These new procedures, if applied as a business model associated to Circular Design of products and services, led companies to reorganize themselves towards cultural, behavioral, and structural changes, influencing experiences and relationships. The case studies reported here are pilot applications conducted in an electronic materials industry and on Internet users. The research was conducted by mapping mindsets and skills, applying Information Technology (IT). The method was developed from doctoral research and transformed into software in an interactive platform for companies, consultants, and users as a tool to guide the provision of technological and scientific support for the realisation of circular projects.

Other methods have not yet been developed to assess the ‘linear to circular’ mindset, using an evaluation software and integrating objective and subjective aspects. This study was the pioneering method to create circular models and provide data support to managers and planners in the beginning of Circular Economy projects. The planning phase of the Circular Economy, circular models, and systemic governance⁴ requires a process vision that includes the organization’s teams. Leaders, employees, CEOs, and founders must be included in the systemic context from the planning phase, defined by the startup EcoRecitec/FlashplayHR as systemic planning.

Platform technology has provided users, such as companies, industries, or consumers, with a global view and the inclusion of human systems from the planning and re-planning phase of circular and technological systems.

Material and methods

The methodology was based on three main steps: (i) definition of the samples to be assessed; (ii) application of the methodological tool in the identified groups in the industry and in a group of Internet users; (iii) analysis of the results of the groups of samples. The method created by Brito⁵ and transformed into a software⁴ was the flashplayHR platform, which allows for the assessment of soft skills in addition to hard skills, although the study was oriented towards the specific assessment of soft skills. In the business world, the use of the word ‘mindset’ has become common.

The platform⁴ is based on the study of mentality to create the Flash Player® tool and complex systems, on biometrics, on the science that studies nature to create innovations and on the psychology of symbols.

The main central mental models, which underlie the tool, are listed below:

- “Linear Mentality (i),” - “Development” and adaptive mindset (ii),”
- “Resilient and Circular Systemic Mindset” (iii), mental models created by Brito,⁴ doctoral research in psychology (in progress).

Two types of groups were observed from the perspective of “linear to circular and systemic”: 1- A group of eighty people from an electronic recovery industry.

2- A group of eighty people, selected randomly among Internet users.

A waste reverse production industry was chosen for the application of the methodological tool. One of two companies in Brazil able to recycle state-of-the-art refrigeration and freezing equipment.⁶ The company was chosen for its pioneering spirit and vision focused on the continuous improvement of the economic model and for a culture that values leadership in sustainability and innovation. The software/quiz was developed through the EcoRecitec Startup (<https://eco-recitec.com.br>) and presented questions related to soft and hard skills. It was applied to employees from the specific industry groups, to identify mindset models on Circular Economy, Circular Models and ESG. The FlashPlayHR® platform was the soft skills assessment. The tests were associated with a systemic perspective and were applied to eighty employees of the industry through the platform, as described in Table 1.

Table 1 Total of individuals (workers) in the industry case study

Sector	Function	Workers (No.)
1 – Leaders	Leaders from different sectors	15
2 – Execution	IT, Projects, Purchasing and Sales	6
3 – Planning	HR, Adm, Research/Innovation, Environment	13
4 – Control Group	Operation (Industrial and Logistics)	36
5 – Others	Other sectors	10
	Total	80

The method was applied to three representative groups:

1 - Leaders, 2 - Execution and 3 - Planning. These groups were selected as references for changing Mindset and Organizational Culture. The analysis of soft skills test responses was performed to identify the mindset profile of employees in these groups. In this way, we tried to understand the trends of the organization under study in

terms of motivation to develop and implement its continuous Circular Economy process.

For the selection of the eighty internet users' group to be evaluated, a campaign was launched in internet offering a free online test to identify the circular economy profile. The Internet users' group was unaware or did not know much about the concept of circular economy. A random group was chosen to conduct the behavioral and mentality study, compared to the people from the industry.

Profile of individuals towards Circular Economy mindset in the case study of internetusers.⁷

The tests applied to such distinct groups provided data generation for a better comparison. The sample defined within the Industry and which had access to the hard skills knowledge of the circular economy, has been working on the concepts in practice, and another external group that had not yet been trained in the Circular Economy theme, as they did not have access to this knowledge in a more didactic way. As can be seen in Table 2, the linear profile prevailed in the group of internet users and the third profile was not identified in that sample: circular, resilient.

Table 2 Total sample of internet users of social reedes

Internet users of social reedes-profile	Facebook, Instagrame WhatsApp	Percentage according to the profile
"Linear Mentality (i)"	45	56,25%
"Development" and "adaptive mindset" (ii)	35	43,75%
Total	80	100%

(iii) Knowledge about the structure of the human personality, formal and informal psychology, associated with philosophical, environmental, social, economic, technological, and business studies around the world, canpoint out the ways out for the transition from linear thinking, entering interaction with curve and circle. In this context, it becomes relevant to describe the importance of interaction between different areas of knowledge.

Results

The industry and user case studies were evaluated for their "circular people skills" Brito Model,⁴ related to socio-emotional aspects and experiences. The main results of the application of soft skills, evaluated by the FlashPlayHR® platform to employees of an Electronic Recovery Industry are illustrated in Figure 1. The industry selected in this study had an organizational culture centered on the circular economy and its characterization when applying the test coincides with the results obtained by www.flashplayHR.com.br/#/ as a "model transition" mentality. Most employees (56%) were focused on the "development(ii) and adaptive(ii) profile", considered the predominant profile of companies that move from the "linear to circular" perspective, referring to the Brito Model.⁴ In the case study, the characteristics of an organization in transition from "linear to circular" were characterized by material indicators, before the application of mindset tests, considered "indicators" in perspective. The classificationas a company in "development (ii)" and "adaptation (ii)" was highlighted by the leadership and planning groups, with 60% and 54%, respectively, of the results in the profile. These groups were considered reference groups for the Circular Economy in Industry. Their collective mentality was framed within the "development"/"adaptive" mentality (ii). On the other hand, half of the employees in the more operational group had profiles of "Adaptability/Development"

(ii) and Linearity (i)" with balanced percentages, that is, there was practically no preponderance between the two types of profiles and mentality The flashplayHR platform , after launching the "linear to circular" profiles, created another functionality defining the linear profile, development and circular/systemic profile in 12 sub-profiles, these last contents will be described in the doctoral thesis that is in progress.

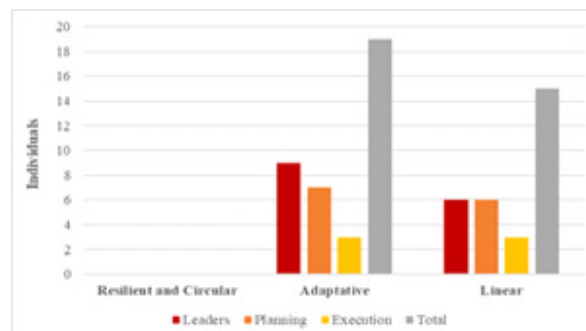


Figure 1 Profile of individuals towards Circular Economy mindset in the case study of the industry.⁷

In relation to the random group of internet users, the "linear mentality" prevailed in relation to the "developing mentality" and the "circular and systemic mentality" of the method.⁴ Comparing the two groups: those internal to the industry and those external to Internet users, it was found that knowledge and training in the circular economy can positively influence a change in mentality.

Discussion

Brazilian and international industry is still focused on linear production models with knowledge and skills more developed by rationality. The international scenario shows a growing awareness of the importance of transversal skills and the gap between the skills of leaders and employees, versus the skills that employers need. This diagnosis refers to skills in general. In the evaluation of "circular soft skills," authored by Brito,⁴ he highlights the importance of a more specific look at the subjective aspects aimed at the development of circular economy projects, ESG and business models.

In this sense, identifying social and emotional skills in this linear to circular perspective favors the development and action aimed at achieving circular objectives, as can be seen in the results of this case study in an electronic recovery industry, located in Brazil. Most employees, with a small margin of difference, were diagnosed as having an adaptive/developmental profile, and the company's leadership prevailed with a greater percentage margin with the same adaptive and developmental profile, this demonstrates a phase of transformation, a change in mentality.

In the external group of internet users, the linear mentality profile prevailed. In the evaluations conducted with this external audience (internet users), interviews were conducted to validate the sample results regarding the use of the flashplay HR platform test. Validation of the results on the effectiveness and efficiency of the method was conducted according to the self-perception of Internet users. Of the group made up of eighty internet users, a part was highlighted for the interviews, a new sample made up of thirty people was randomly selected from the larger group. In this new sample, the previously mentioned perception interviews were applied.⁸⁻¹¹

The interviews were conducted using online forms, resulting in the recognition of the effectiveness and efficiency of the tests by 99% of the internet user sample. The interviews began with this group as

it was considered a group with greater authenticity. Business groups sometimes want to demonstrate skills that they often do not possess.

Conclusion

The present study is an innovative approach for the application of an IT tool aimed at the strategic human resources of an Industry, but which can also be used by the innovation and sustainability sectors of organizations in their circular planning, in the interested parties, as well as and to understand the profile of online consumers.

Carrying out a diagnosis, resulting from the application of a mindset assessment software in a “linear to circulate” perspective, on employees and stakeholders of an electronic recovery industry, had a positive impact on the process of understanding the concepts and learning the complexity of the industry management and Circular Economy planning, providing data and content for the development of strategies and tactical and operational planning with a systemic and inclusive view of employees, stakeholders and leaders.^{12–16}

Thanks to the case studies presented here, the technology was again validated. The FlashplayHR Platform really delivers essential data and content for the systemic and integrated planning of the areas, creating conditions for the leadership of circular processes and innovation to be successful in their circular processes from planning, providing technical support for an accurate and agile identification of the transition phase in relation to circular innovation, from the perspective of the linear to circular mentality method.⁴ The method/software presented will also facilitate the integration of different areas, committees and boards of management and administration in companies.

The study shows that when identifying the characteristics of the employees’ mindset and skills, the industry evaluated here has characteristics of “development” (ii) and “adaptation” (ii). The non-appearance of the “circular, systemic” (iii), “resilient” (iii) profile in the samples demonstrates the need for investments in the training and qualification of the technical team at distinct levels of the organization, to facilitate the transition to take place continuously, without obstacles and interruptions.

Comparing the Industry groups with the random group of internet users, it appears that in the Industry sample group, the adaptive and developing profile prevailed, and in the profiles of Internet users, the linear, Cartesian profile prevailed, a result that also reinforces the importance of theoretical knowledge for learning about the management of circular systems. Increasingly complex systems will require business leaders, CEOs, and founders to develop skills and competencies related to circular models, ESG and the Circular Economy.

The comparison between the external group of Internet users and the industry’s internal ones opened possibilities for a comparative evaluation of these skills. The amount of data and content generated will be able to subsidize several analyses, evaluations, and conclusions in the companies. The method/software www.flashplayhr.com.br/#/ was not used in all its functionalities in the case study reported here, thus identifying one of the limitations of the study.

Thus, future studies will be able to address the specific knowledge and skills competencies of employees, stakeholders, and consumers in different sectors, as well as apply the instrument throughout the innovation ecosystem for Circular Economy and ESG.

The tool used (FlashPlayHR®) proved to be useful to identify the mindset of leaders, employees and Internet users in a “linear to

circular” perspective, the results defined new circularity indicators (in a mental perspective) related to the planning and management of the circular economy, positioning the Industry in a transition phase, corroborating these results with the materiality indicators identified in the aforementioned Electronic Industry, before this research.

This diagnosis has been used to outline projects and systems with more precision and agility, with the inclusion of the company’s team in the planning, implementation, and management phase, and can be applied in other productive sectors and innovation pilot projects.

The next studies will be conducted in other industries and schools, considering the peculiar culture of companies and educational institutions. Emphasizing that the data from this case study are part of a broader context of the author’s Doctoral study in Psychology, the data and results will be studied in a broader, more detailed, and in-depth way.

With the use of the method on the FlashplayHR platform, more accurate diagnoses of other industries and organizations, consumers will be built and presented in the form of articles and thesis reports. Startup EcoRecitec Circular Economy, Sustainability and Technology is looking for partners that may be contributing to a greater application of the software in circular model strategies.

Conflicts of interest

The author declares that there is no conflicts of interest.

Acknowledgments

This article is part of the Doctoral Thesis by Celene Brito, started in 2018 at UCES-Business and Social University- Argentina, and describes the method of a software- Flashplayhr, with all rights reserved to the author. In the doctoral work, it was identified that mentality and culture barriers can generate several obstacles to the development of the Circular Economy, circular models and ESG, and aimed to find ways and guidelines for solving the problem. This article is based on several case studies presented at RemTech Europe on September 23, 2022.

The Author would like to thank everyone who contributed to this Doctoral research (in progress). The Author also thanks the leaders and collaborators who supported the research in the industry case study, as well as all partners and EcoRecitec Devs, who developed the FlashplayHR Platform.

Funding

None.

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