CONSUMER'S WILLINGNESS TO ENGAGE IN THE CIRCULAR ECONOMY: THE HIGHER EDUCATION OUTLOOKS

Wellington Alves
Escola Superior de Ciências Empresariais, Instituto Politécnico de Viana do Castelo, and
ALGORITMI Research Centre, University of Minho,
Escola de Engenharia, Depto Produção e Sistemas, Campus de Azurém, Portugal
E-mail: wellingtonalves@esce.ipvc.pt / Wellingtonbn@gmail.com

Ângela Silva
ADiT-LAB, Instituto Politécnico de Viana do Castelo, Rua Escola Industrial e Comercial Nun'Álvares,
4900-347 Viana do Castelo, Portugal
ALGORITMI Research Centre, University of Minho, Guimarães, Portugal

E-mail: angela.a@esce.ipvc.pt

Helena Sofia Rodrigues
Escola Superior de Ciências Empresariais, Instituto Politécnico de Viana do Castelo, and
CIDMA - Centro de Investigação e Desenvolvimento em Matemática e Aplicações,
Universidade de Aveiro, Portugal
E-mail: sofiarodrigues@esce.ipvc.pt

Abstract: As a forefront approach of sustainability, Circular Economy (CE) has been considered one of the most powerful principles of modern society. It due to resource consumption continues to rise, governments and companies have started looking at the circular model, as a hedge against resource scarcity and as an engine for innovation and growth. This paper aims to bring together CE and consumer's perspective, to perceive the impact of buyer's choice on CE initiatives. A survey was conducted having in mind the engagement of the consumer with the circular economy concepts. The results pointed out the awareness and willingness of consumers for the transition of the linear to the circular production model, providing a value add by consumers for reducing environmental impacts and enhancing sustainability through CE initiatives such as reuse repairability.

Keywords: Logistics, Circular Economy, Reuse, Repairability, Consumers

1 INTRODUCTION

Over the last decades, sustainability has been considered one of the most powerful principles of modern society. This principle has been contributing to society increase the value of sustainable technologies, processes and products that, either have zero impact on our ecosystem or function within the limits of its carrying capacity. Also, society is increasingly sensitive to issues related to sustainable values [1].

From the industrial perspective, this sector faces significant economic and environmental challenges towards a sustainable process. Challenges such as the lack of non-renewable resources have culminated in a prompting call for disseminating initiatives aiming to develop sustainable business models in the industrial sector [2].

Circular Economy (CE) has emerged as an alternative to achieve sustainability, for both industries and governments. According to Ellen MacArthur Foundation [2], CE can be defined as a restorative industrial system. Replacing the concept of the end's life and shifts towards a business model which consider waste elimination from the design to a disposal of a product or service in all stages of production.

Also, Morseletto [5] defends that as an economic model, CE can be seen as an efficient approach to use resources through waste minimization towards a closing loop of products,

contributing to environmental protection and delivering social benefits. In doing so, CE aims to reduce the negative impacts of the linear economy through building long-term resilience business and economic opportunity, to provide environmental and social benefits.

As a sustainable approach, initiatives related to CE has been increasingly in developing and developed economies. It has been supporting different sectors of economies such as industrial, tourism and services to emphasize the importance of waste reduction, from the design to disposal in all stages of their production, and contributing to both sustainability and close the loop of the supply chain.

Despite the increasing attention of researchers and practitioners in the CE field, few studies have investigated the possibility of CE be integrated with other approaches, which can also contribute to achieving sustainability. As such, the engagement of companies, governments, and consumers into initiatives towards CE, can be a key element to closing the loop in the traditional linear economy model.

Logistics activities can be seen as a decisive element for the supply chain, since its directly associated with two main aspects, namely consumption of resources by costumers, and the possibility to serve as a bridge to manage the waste generated by costumers in the product's end-of-life. In the supply chain, each stage could obtain raw materials to end-of-life, when well-managed, these products can contribute to the overall circularity as well as sustainability [3-4]. In this perspective, this research aims to understand the impact of consumers choices on CE initiatives.

2 METHODOLOGY

This section presents an overview of the main steps adopted in this research to achieve the objective proposed. The work was designed to assess CE in terms of consumers' value, considering logistics activities as a major player to CE. The work was developed as follows:

1) The research began with an initial screening of studies in the topic CE, with its challenges and benefits, were carried out;
2) Based on step 1, a questionnaire was developed to understand consumers' willingness to embrace CE practices. The questionnaire was inspired by the previous report published by European Commission (see: Implementing Framework Contract – _CHAFEA/2015/CP/01/LE) [7]. The survey is composed of three parts: the first one is related to general information about the inquiry to describe the sample taken; the second part has questions associated with CE behaviours and environmental attitudes; the last one is concerned with the durability and reparability of the products;
3) The questionnaire was then applied. The sample consists of 123 inquiries, with are enrolled in Higher Education Institutions. The was chosen by convenience, due to time and budget constraints.
4) A statistical analysis was developed resorting to IBM SPSS version 27;
5) Based on the achieved results from the questionnaire, the linkage between Logistics and CE was established, focus on aspects such as reparability, availability to spare part and repair.

The undertaken and summarized steps presented in this section were used as a strategy to capture consumer's behaviour towards moving on an alternative to the traditional linear economy; then to draw suggestions regarding the role of logistics activities in this shift.

3 RESULTS AND ANALYSIS

This section presents the main findings achieved in this research. Regarding the sample, it is related to both genders (67% female and 33% male, approximately), where 75% of the inquiries are under 25 years, and 45% of them attend training in the logistics field.

3.1 The connection between CE and environmental attitudes

In this research, a four-point Likert Scale (1- Strongly disagree, 2- Tend to disagree, 3- Tend to agree, 4- Strongly agree) was used to assess the general CE-related behaviors. Figure 1 shows the level of agreement for each sentence described in Table 1. Overall, inquiries agree with the CE statements, particularly those relating to long-term possession (CE1) or repair/recycle (CE2 and CE3) of the item. The results showed that more than 50% of participates do not buy the latest fashion clothes or electronic goods and gadgets (CE5 and CE6). When compared with the EU report, the students adopt similar behaviors as the rest of European consumers, increasing the purchase of second-hand items. In order to refine the analysis, the Mann-Whitney U test was developed to understand if gender and training in logistics could influence the answer given (Table 1).

Table 1 – Statistics analysis for Agreement Level on Circular Economy behaviours

	Descriptive Statistics				Mann-Whitney U test (significance level 0.05)	
	Min	Max	Mean	St. Dev.	By gender (sig.)	By logistics training (sig.)
CE1 - I always keep things I own for a long time	1	4	3.24	0.682	0.004	0.847
CE2 - I always recycle my unwanted possessions	1	4	2.82	0.758	0.019	0.218
CE3 - I always repair my possessions if they break	1	4	2.71	0.674	0.288	0.476
CE4 - I buy second hand products	1	4	2.29	0.908	0.402	<0.001
CE5 - I always buy the latest fashion for clothes	1	4	2.15	0.736	0.479	0.481
CE6 - I always buy new the newest electronic goods and gadgets	1	4	2.55	0.960	0.632	0.568

The results showed that there is a difference of opinions according to gender in items CE1 and CE2. After carefully analyzing the answers, it was possible to confirm that there is a higher level of dispersion of agreement level for men answers, while the female inquiries tend to choose the positive agreement levels of the items. Regarding the logistics training as a factor of differentiation, there is no significant difference between groups, except the item CE4, where the individuals who had no training in logistics tend to disagree with the sentence, while the others tend to agree.
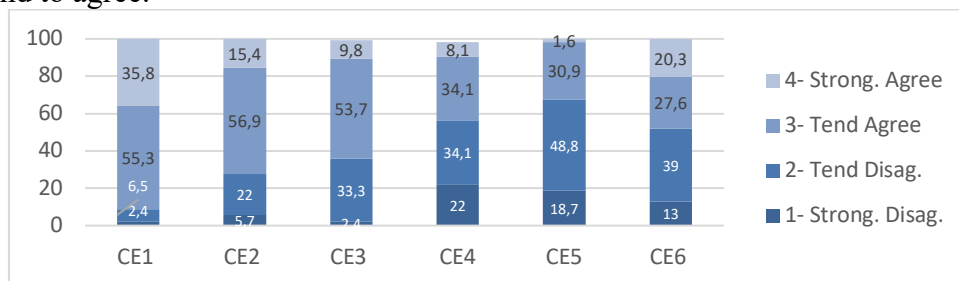

Figure 1 - Agreement Level (%) on Circular Economy behaviours

Furthermore, Figure 2 and Table 2 summarizes the results related to environmental attitudes. The analysis showed that the inquiries tend to agree with all sentences, particularly the consciousness of being environmentally friendly and they tend to show this attitude in front of other people (EA1 and EA2). In this direction, the results showed that this behavior was considered as the lower score of item EA6.
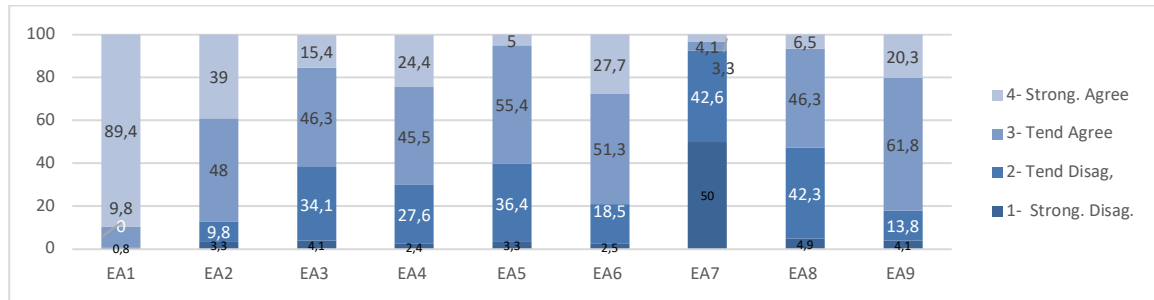
Figure 2 - Agreement Level (%) on environmental attitudes

Despite this environmental attitude, the third sentence that drawn more positive responses was EA6. It could be positive when it is adopted to buy products that could be considered eco-friendly. On the other, it could have a negative impact if the idea is to discard an old model or not to try the fix a good product. Using the nonparametric test Mann-Whitney, it is shown that there are differences of opinions when it is compared according to gender factor in items EA1, EA2, and EA6. Following the previous dimension, women tend to give more positive answers. There is no difference in agreement levels when the environmental attitudes are evaluated when education qualifications are considered.

Table 2 - Agreement Level on environmental attitudes

	Descriptive Statistics				Mann-Whitney U test (significance level 0.05)	
	Min	Max	Mean	St. Dev.	By gender (sig.)	By logistics training (sig.)
EA1- It is important to be environmentally friendly	1	4	3.88	0.396	0.022	0.616
EA2 - I want my friends to know that I care for the environment	1	4	3.23	0.755	0.006	0.980
EA3 - When I buy things, I know the expected lifespan of the product	1	4	2.73	0.769	0.051	0.777
EA4 - I am aware of repair services for the products I own	1	4	2.92	0.785	0.100	0.760
EA5 - Second hand products are usually good quality	1	4	2.62	0.636	0.561	0.265
EA6 - I much prefer possessions that are brand new	1	4	3.04	0.752	0.012	0.503
EA7 - I want my friends to know I own the latest trends or fashion	1	4	1.61	0.722	0.990	0.503
EA8 - I trust claims made by companies about their products	1	4	2.54	0.692	0.065	0.089
EA9 - If something is good enough I don't need it to be perfect	1	4	2.98	0.713	0.540	0.900

3.2 Durability and reparability of products

In this section, the results are discussed in light of three associated concepts, namely CE durability and reparability of the products. When there is an increasing the reuse and repair of products, it contributes to some aspects such as reduce waste and providing consumers financial gains. The results also put in evidence that consumers could also benefit from better environmental information and improved enforcement of guarantees.

The results presented in Figure 3 show that more than 50% of the sample agree or strongly agree with the sentences. The searching for durability and reparability information is high when they buy products. Yet, respondents often felt these features difficult to find.
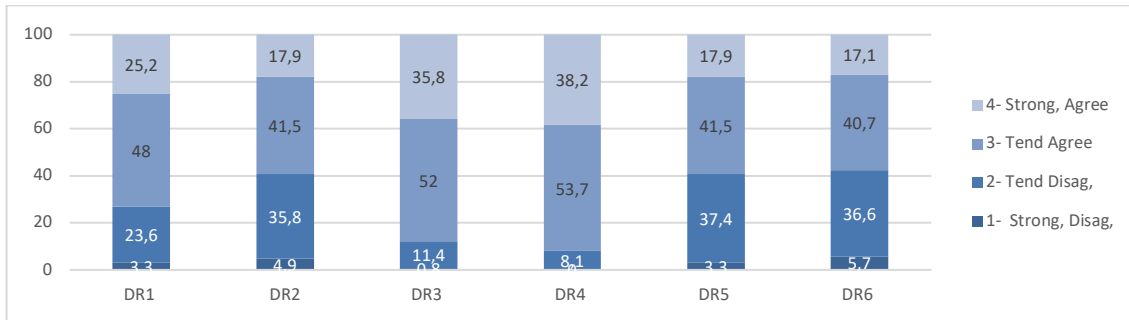
Figure 3 - Agreement level about durability and reparability information

Table 3 shows that the inquiries tend to agree with the statements. Regarding the Mann-Whitney tests, female respondents strongly agreed with sentence DR3, when compared with male individuals (DR3). Besides, the respondents that are not from the logistics area, do not feel the need to have additional information about the reparability of the product, when compared with the ones that are from the logistics area (DR4).

Table 3 - Agreement level about durability and reparability information

	Descriptive Statistics				Mann-Whitney U test (significance level 0.05)	
	Min	Max	Mean	St. Dev.	By gender (sig.)	By logistics training (sig.)
DR1 - I always search for information on how long a product will last	1	4	2.95	0.788	0.565	0.595
DR2 - I always search for information on how easy it is to repair a product	1	4	2.72	0.813	0.093	0.676
DR3 - I would like to receive better information on how long a product will last	1	4	3.23	0.675	0.026	0.059
DR4 - I would like to receive better information on how easy it is to repair a product	2	4	3.30	0.613	0.130	0.032
DR5 - It is difficult to find information on how long a product will last	1	4	2.74	0.788	0.694	0.080
DR6 - It is difficult to find information on how easy it is to repair a product	1	4	2.69	0.821	0.575	0.098

Finally, the respondents were asked to rate their experience related to the repair service of a product. Table 4, demonstrates that for the case of the ones that already have used a repair service, the experience was positive. These results are in line with the ones achieved by the EU report, which shows the awareness of these consumers.

Table 4 – Satisfaction with professional repair services

	1 Very poor	2 Fairly Poor	3 Fairly good	4 Very good	Min	Max	Mean	St. Dev.
RS1 – Convenience	3.9	8.8	69.6	17.6	1	4	3.01	0.652
RS2 – Speed of repair	6.7	27.6	51.4	14.3	1	4	2.73	0.788
RS3 – Consumer friendliness	1.9	7.8	53.4	36.9	1	4	3.25	0.682
RS4 – Quality of the repair	3.9	4.9	59.2	32.0	1	4	3.19	0.701

As summarized in Table 4, the time of repair of the product was the lowest-ranked level of satisfaction, while the consumer-friendliness was the highest.

4 CONCLUSIONS

The transition of Linear to Circular Economy has prompted industries and consumers the shift the production and consumption approaches. This research has sought out some aspects related to CE and its contribution from the consumer's side. Based on the results achieved, it was possible to conclude that aspects such as reuse and better design can contribute to the transition to a circular economy can significantly reduce the material bill and the expense of disposal. However, as consumers have the power to choose every time, they make a purchase, the success to pass from a linear to a circular economy may require a shift of consumers in this paradigm.

There is a window of opportunities for companies to implement circular flows and initiatives. At this moment, this research shined that from the young consumers' point of view, there is already an environmental awareness. The fact that only students of higher Education have answered the survey is a limitation to this work. But, at least, it can be considered a first path towards the transition from the consumer perspective. For future work, the authors are going to extend the sample a wider audience to check if this opinion remains the same or have reasonable difference between the age and educational qualification.

However, the buying level of second-hand products is still lower. The mind-set change to repair a product instead of buying a new one could be improved. At this moment, the information about the reparability and durability of a product was considered as a barrier to consumers. Nevertheless, when they decided to use repair service the general level of satisfaction is high. This research is part of an ongoing project, and the preliminary results are summarizing in this research. Also, as the next step, the authors are going to analyse the trade-off between the expenditure by companies when providing better repair service, or to contribute to discard the old products taking a specific product as a sample (TV/Smartphone).

References

[1]   D. A. R. George, B. C. Lin, and Y. Chen, "A circular economy model of economic growth," *Environ. Model. Softw.*, vol. 73, pp. 60–63, 2015, doi: 10.1016/j.envsoft.2015.06.014.

[2]   M. L. Tseng, A. S. F. Chiu, G. Liu, and T. Jantaralolica, "Circular economy enables sustainable consumption and production in multi-level supply chain system," *Resour. Conserv. Recycl.*, vol. 154, no. November 2019, p. 104601, 2020, doi: 10.1016/j.resconrec.2019.104601.

[3]   Ellen MacArthur Foundation, "Towards the Circular Economy," 2013. doi: 10.1162/108819806775545321.

[4]   Morseletto, "Targets for a circular economy," *Resour. Conserv. Recycl.*, vol. 153, no. October 2018, p. 104553, 2020, doi: 10.1016/j.resconrec.2019.104553.

[5]   S. Jain, N. K. Jain, and B. Metri, "Strategic framework towards measuring a circular supply chain management," *Benchmarking An Int. J.*, vol. 25, no. 8, pp. 3238–3252, Nov. 2018, doi: 10.1108/BIJ-11-2017-0304.

[6]   V. Julianelli, R. G. G. Caiado, L. F. Scavarda, and S. P. de M. F. Cruz, "Interplay between reverse logistics and circular economy: Critical success factors-based taxonomy and framework," *Resour. Conserv. Recycl.*, vol. 158, p. 104784, Jul. 2020, doi: 10.1016/j.resconrec.2020.104784.

[7]   European Commission, "Behavioural study on consumers' engagement in the circular economy," 2018. [Online].
         Available: https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf.