

# ORGANIZATIONAL READINESS FOR PROCUREMENT 4.0 IN CIRCULAR ECONOMY: THE MODERATING ROLE ON COMPETITIVENESS

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## Abstract

*The goal of this study is to see if organizational readiness for procurement 4.0 has an impact on organizational competitiveness in the context of the circular economy. The study also looks at the role of organizational readiness for procurement 4.0 as a moderator. The findings of a two-way moderated multiple regression analysis revealed that we are dealing with an enhancing moderation effect. We noticed a substantial rise in the influence of the predictor, circular economy openness, on the outcome, organizational competitiveness, as we increased the moderator, organizational readiness for Procurement 4.0. Organizations with a high level of openness to the circular economy and organizational readiness for procurement 4.0 scored the most. Furthermore, at high levels of openness to the circular economy, we observed similar competitiveness at all levels of organizational readiness for Procurement 4.0.*

**Keywords:** Procurement 4.0, Competitiveness, Circular Economy, Moderating effect

## 1. INTRODUCTION

In today's markets, customers are increasingly aware of their own consumption and choose to buy sustainable products and services over non-sustainable alternatives when prices are comparable. Furthermore, an increasing number of consumers tend to purchase sustainably manufactured products or services even if the price is higher as some added value benefits, such as planet care, improved health, as well as others, are perceived (Alonso-Almeida et al., 2020). Therefore, organizations must adapt to this changing context in their attempt to satisfy customer needs, as transitioning from a linear economy to a circular economy is a significant issue for long-term sustainability and competitiveness.

According to Cadez et al. (2019), the market's endorsement of circular economy is critical to effecting a genuine shift in consumption toward a more sustainable manufacturing model. Furthermore, in this competitive and continuously expanding technological business environment, how organizations manage their supply chains plays a significant role in determining their long-term development and success (Joseph-Jerome et al., 2021). As a result, obtaining all of the necessary resources in an effective and efficient manner is critical.

In recent years, organizations have faced radical change since worldwide connectivity and real-time information transfer enable companies to invest in innovation and ideas within their operational area on the one hand, and growing competition, also resulting from new industry entries, pressures firms to enhance their ability for innovation to stay ahead of competitors within the newly created business concepts (Bienhaus and Haddud, 2018).

In this research, we apply the Industry 4.0 principles to procurement, which is among the basic components of supply chain management. Procurement 4.0 is the meeting point between Industry 4.0 and the procurement function of a supply chain (Bag et al. 2020). A study by Ćwiklicki and Wojnarowska (2020) stated that,

potentially, the following three possible variations in direction are possible: CE contributes to Industry 4.0, Industry 4.0 influences CE, or the two ideas are inextricably linked. In this study, we start from the third possibility, while adding the goal of competitiveness. A company's competitiveness is determined by its surroundings and the area where it is situated, just as a firm's well-being is determined by the potential of having competitive firms in its region that may generate wealth and excellent jobs.

As a result of all the research mentioned, we suggest the research questions listed below with the aim of analyzing whether organizational readiness for procurement 4.0 has an impact on organizational competitiveness in the context of the circular economy. Additionally, the study looks at the role of organizational readiness for procurement 4.0 as a moderator.

RQ1. Are companies that embrace the circular economy more competitive?

RQ2. Is there a greater impact of circular economy openness on competitiveness if the organization is ready for procurement 4.0?

Furthermore, the next sections of the paper reveal the research hypotheses based on the literature review, explain the research methodology, present the statistical analysis and results while discussing the results afterwards followed by conclusions.

## 2. LITERATURE REVIEW

### 2.1. *Organizational Readiness for Procurement 4.0*

The intelligent breakthrough or fourth revolution is viewed by industry as a highly innovative advancement, recognized as Industry 4.0, as a change that will make it possible to collect, investigate, and make sense of the data across computers, enabling faster, more able to adapt, and more competent cycles to develop greater products at a lower cost. This interaction between technology, the Internet, knowledge, and humans will increase efficiency, advance financial elements, foster contemporary growth, and change the labor force profile, ultimately increasing the severity of rivalries between companies and other organizations (Nara et al., 2021).

Procurement will increase its corporate value as an innovation driver in the digital age by connecting critical external knowledge and abilities with interior business aspects to build their supply chains increasingly efficient and competitive (Joseph-Jerome et al., 2021). Technologies specific to the digital age as through the lens of Industry 4.0 have the capacity to respond to specific procurement challenges by reducing lead times, enhancing communication and transparency, and provide useful information about stringent managerial decision, for example, the decision of outsourcing, whether to make or buy certain components or even products or services.

Some studies (Joseph-Jerome et al., 2021; Gupta et al., 2020) demonstrated that as a result of Procurement 4.0 system integration, recruiting vendors, and streamlining the loop from the supplier's supplier to the customer's customer become even more efficient. Procurement 4.0 can help minimize order expenses by automating the order process, as well as reducing the time of the procurement circuit by automating transactional tasks. It reduces ambiguity, enhances visibility, and helps in the proactive approach to difficult circumstances. The future will be even more time - saving and cost - effective, purchasing tactics will alter, real-time analysis will be possible, and it will also enhance the experience among both suppliers and clients.

However, several studies also emphasized the barriers to adoption of procurement 4.0. Within those barriers, Joseph-Jerome et al. (2021) emphasized: Organizational and employee inertia; Lack of interdepartmental communication; Lack of resources for training; Cultural change; Data security and confidentiality; Lack of supplier willingness and capabilities; Lack of information technology and information system infrastructure; Lack of information technology and information system infrastructure; High and unclear investments; Perceived ease of use and usefulness; Lack of support from management due to uncertain return on investments. Therefore, we assumed that organizations need to be ready for Procurement 4.0. In this regard, we constructed the variable Organizational Readiness for Procurement 4.0 (ORP4.0), based on previous research (Akter et al., 2016; Bag et al., 2020; Bag et al., 2021; Bienhaus and Haddud, 2018; Ceglieski et al., 2012; Telukdarie et

al., 2018; Themistocleus et al., 2000). ORP4.0 as described in Table 1 measured the ability to process information, the intention to optimize the procurement process, and the managerial resources for Procurement 4.0 implementation.

## 2.2. Circular Economy Openness

The notion of circular economy is characterized as a "regenerative system in which resource input and waste, emission, and energy leakage are reduced through slowing, shutting, and narrowing material and energy loops." This can be achieved through the use of long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishment, and recycling" (Geissdoerfer et al., 2017).

The basic purpose of the circular economy is to extract as much value as possible from items through a compact, closed loop of restoration and reuse in order to maximize financial and environmental efficiency (De Angelis et al., 2018). The use of circular economy techniques benefits industrial businesses in the long term by reducing raw material consumption and improving their innovative capabilities (Ghisellini et al., 2016). Circular economy is the most recent idea that improves economic, ecological, and social factors in businesses in order to persuade society to resilience by incorporating all participants. According to the CE paradigm, human life is linked to nature and, therefore, it is necessary to prevent resource degradation and close energy and material cycles, thus encouraging sustainable development (Geissdoerfer et al., 2017).

The circular economy viewpoint on supply chains emphasizes the need to maintain, reuse, remanufacture, and recycle commodities to optimize resource use efficiency. Supply chain management may profit from new economic prospects for the circular economy, but, more significantly, it may benefit society by reducing waste and reusing it (Noyal et al., 2022).

Urbanati et al. (2017) stressed the importance of future theoretical and empirical research on the role of managerial commitment in formulating and delivering circular-oriented policies and goals, trying to educate internal resources, and trying to raise awareness regarding the importance of product development methods between all supply chain participants. Furthermore, Ünal et al. (2018) emphasized that management involvement is critical in environmental initiatives. Furthermore, organizational opposition to sustainability efforts is much greater than for other strategic change projects (Wichmann et al., 2016). For these reasons, we have chosen to investigate the extent of openness to the circular economy at the management level and whether it impacts organizational performance.

## 2.3. Competitiveness

Competitiveness is a complex phenomenon, which, on the one hand, refers to the ability of a country to ensure an economic, political and social environment that promotes and adds value, but, on the other hand, the term refers not only to nations, but also to companies that develop relationships with each other, but also to supply chains, customers, and even other competing companies that help gain the competitive advantage to sell products and services (Porter, 2008). This paper refers to competitiveness at the company level.

Competitiveness comes from competitive advantage and it was noted that achieving and maintaining competitive advantages could be accomplished through value added for the business and its consumers, meticulous cost planning, certain factors of differentiation, focusing on a specific niche audience, globalization, innovation, cooperation, co-optation, and so on (Kryscynski et al., 2021).

As a result, in order to achieve and maintain a competitive position of the organization in the face of mounting and dynamic complexities of the competitive environment, we believe it is necessary to reassess procurement activities in order to create strategies that mirror market realities and maintain a competitive advantage in the medium to long term. There are several dimensions of competitiveness, which cannot be included in a single paper. The dimensions considered in this paper are described in Table 1 and are the result of previous research (Bunea, 2019a; Bunea, 2019b; Corboș et al., 2019).

As a consequence of the context provided by the literature review, we examine the two hypotheses listed below.

H1. Managers' openness to the circular economy (CEO) is a predictor of the organization's competitiveness (COM).

H2. Organizational readiness for procurement 4.0 (ORP4.0) has a favorable impact on the path connecting circular economy openness (CEO) and organizational competitiveness (COM).

Figure 1 shows the conceptual framework and how empirical tests will be carried out.

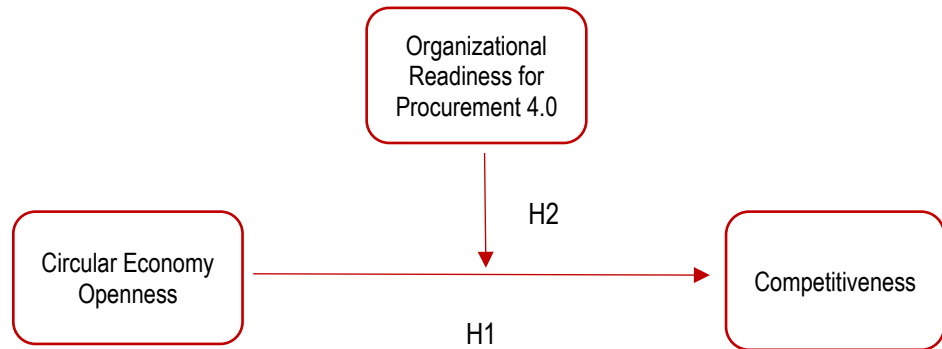


FIGURE 1 - CONCEPTUAL FRAMEWORK

Source: Authors (2022)

### 3. RESEARCH METHODOLOGY

#### 3.1. Research sample, method, and data collection

The purpose of this research is to determine whether organizational readiness for procurement 4.0 influences organizational competitiveness in the context of the circular economy. The study also investigates the moderating effect of organizational readiness for procurement 4.0. To achieve this, we focused on the research target group, which included large companies operating in Romania. A large company is defined as one with a yearly revenue of more than EUR 50 million and a workforce of more than 250 people. We chose this classification method, as well as the reference values for annual revenue and employee number, based on the European Commission's user manual for defining small and medium enterprises (European Commission, 2015).

Furthermore, we chose to concentrate our research on large corporations because we believed that their level of development, both strategically and in terms of potential, knowledge, and resources required to think about and implement a procurement process 4.0 in the context of the circular economy, was much higher.

We used the survey as a research method and the questionnaire as a research tool, both of which were created in Google Forms and distributed by email, as this was the most cost-effective and user-friendly method.

Therefore, we were able to obtain 85 responses from the target group of 466 organizations, which we then evaluated to test our hypothesis. This resulted in a response rate of 18.24 percent. We believe that this response percentage is appropriate in light of the COVID-19 pandemic, the level of growth in the Romanian business environment, and other supply chain studies, such as Zhang et al. (2018), which showed a response rate of 7.15 percent. We also determined that, despite the modest sample size, the dispersion of enterprises in various spheres of operation makes the sample representative.

### 3.2. Research variables

We followed a strict procedure when it came to operationalizing the constructs and developing the study variables. As a consequence, the questionnaire elements from which the study variables were derived were based not only on a literature survey, but also on discussions with many experts and academics in the fields of procurement, supply chain, and environment to whom we had access.

The scales we employed have also been shown to have a high level of dependability, since they have been utilized in numerous previous research projects over the years. In the case of all of the variables we utilized, our questions tested the degree of agreement using a Likert scale from 1 to 5 (1 = "strongly disagree" - 5 = "strongly agree").

Table 1 offers explanations for the study variables we used, as well as their full name abbreviation, description, and references.

TABLE 1 - DEPENDENT AND INDEPENDENT RESEARCH VARIABLES

<i>Variable and Abbreviation</i>	<i>Indicator</i>	<i>Description</i>	<i>References</i>
<b>Organizational readiness for procurement 4.0 – ORP4.0</b>	ORP4.01	To what extent can our company access systems on various platforms used by vendors.	Bag et al. (2020); Ceglieski et al. (2012)
	ORP4.02	The extent to which our company has transparent interfaces between systems.	Bag et al. (2020); Ceglieski et al. (2012)
	ORP4.03	The extent to which our company's IT infrastructure provides seamless access to physical locations and multiple user entry points.	Bag et al. (2020); Ceglieski et al. (2012)
	ORP4.04	The extent to which supply chain partners can access real-time transaction data using I4.0 systems.	Bag et al. (2020); Themistocleus et al. (2000)
	ORP4.05	To what extent do our computer systems have the ability to communicate with each other over a network.	Bag et al. (2020); Themistocleus et al. (2000)
	ORP4.06	The extent to which our company has sufficient resources and capabilities for digital transformation.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.07	The extent to which our employees have the appropriate skills for digital transformation.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.08	The extent to which purchasing agents in our company have shown interest in adopting automated procurement / supply chain processes.	Bag et al. (2020); Bienhaus and Haddud (2018); Telukdarie et al. (2018)
	ORP4.09	To what extent is the intention to use the basic Industry 4.0 tools seen among our buyers.	Bag et al. (2020); Bienhaus and Haddud (2018); Telukdarie et al. (2018)
	ORP4.010	The extent to which the intent to use Advanced Industry 4.0 tools is seen among our sourcing agents.	Bag et al. (2020); Bienhaus and Haddud (2018); Telukdarie et al. (2018)
	ORP4.011	The extent to which our buyers intend to optimize energy, save on natural resources and purchase cycle time.	Bag et al. (2020); Bienhaus and Haddud (2018)



## ORGANIZATIONAL READINESS FOR PROCUREMENT 4.0 IN CIRCULAR ECONOMY: THE MODERATING ROLE ON COMPETITIVENESS

<i>Variable and Abbreviation</i>	<i>Indicator</i>	<i>Description</i>	<i>References</i>
	ORP4.012	The extent to which the intention of improving supply chain connectivity is dominant among our company's buyers.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.013	To what extent does our company intend to integrate procurement into general management development and training programs.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.014	The extent to which our company intends to pursue agile and customer-oriented procurement.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.015	The extent to which our company's buyers have indicated their intention to stimulate green purchasing.	Bag et al. (2020); Bienhaus and Haddud (2018)
	ORP4.016	The extent to which innovative opportunities for the strategic use of P4.0 systems are being explored.	Bag et al. (2021); Akter et al. (2016)
	ORP4.017	The extent to which appropriate plans are in place for the introduction and use of P4.0 systems.	Bag et al. (2021); Akter et al. (2016)
	ORP4.018	The degree to which the P4.0 planning processes are performed in a systematic and formalized manner.	Bag et al. (2021); Akter et al. (2016)
	ORP4.019	The degree to which P4.0 plans are frequently adjusted to better adapt to changing conditions.	Bag et al. (2021); Akter et al. (2016)
	ORP4.020	To what extent, when making investment decisions P4.0, we think and estimate the effect they will have on employee labor productivity.	Bag et al. (2021); Akter et al. (2016)
	ORP4.021	The extent to which within the organization, business analysts and line people from different departments frequently attend cross-functional meetings.	Bag et al. (2021); Akter et al. (2016)
	ORP4.022	The extent to which information is widely shared within the organization between business analysts and the procurement team, so that decision makers or executives have access to all available know-how.	Bag et al. (2021); Akter et al. (2016)
	ORP4.023	The degree of confidence in the organization that the P4.0 project proposals are properly evaluated.	Bag et al. (2021); Akter et al. (2016)
	ORP4.024	To what extent does the analysis department clearly define its performance criteria.	Akter et al. (2016)
<b>Circular Economy Openness - CEO</b>	CEO1	The degree to which the company is up to date with the principles of the circular economy.	Ștefănică et al. (2020)
	CEO2	To what extent does the organization aim to identify ways to make the transition from a "linear economy" to a "circular economy".	Elia et al. (2017)
<b>Competitiveness - COM</b>	COM1	Economic and financial performance according to the company's objectives.	Bunea (2019a); Corboș et al. (2019)
	COM2	Economic and financial performance compared to five years ago.	Bunea (2019a); Corboș et al. (2019)
	COM3	Economic and financial performance compared to the main competitors.	Bunea (2019a); Corboș et al. (2019)
	COM4	Perceived competitiveness according to the company objectives.	Bunea (2019a); Corboș et al. (2019)
	COM5	Perceived competitiveness compared to five years ago.	Bunea (2019a); Corboș et al. (2019)
	COM6	Perceived competitiveness compared to the main competitors.	Bunea (2019a); Corboș et al. (2019)

Variable and Abbreviation	Indicator	Description	References
	COM7	The extent to which the organization's knowledge and skills are used in an innovative way.	Bunea (2019b)
	COM8	To what extent does the organizational structure conducive to innovation to allow the creation of new products for a better position in the market and in new markets.	Bunea (2019b)
	COM9	The extent to which the novelty elements that were initially developed within other organizations have been fully taken over.	Bunea (2019b)
	COM10	To what extent have research and development activities been carried out within the company.	Bunea (2019b)
	COM11	The extent to which the organization has cooperated with other organizations in carrying out research and development activities.	Bunea (2019b)
	COM12	The extent to which the organization considers that ethics is important in relations with stakeholders (customers, suppliers, investors, etc.) along with a high level of trust, cooperation, and exchange of information.	Bunea (2019b)
	COM13	The extent to which the organization initiates and participates in collaboration agreements with other competitors.	Bunea (2019b)
	COM14	To what extent is the attraction and shared use of similar resources promoted in cooperation relations.	Bunea (2019b)
	COM15	The extent to which the organization recruits third parties to gain access to certain markets.	Bunea (2019b)
	COM16	To what extent does the organization seek to strike a balance between the interests of third parties and its own by gaining competitive advantage to create new opportunities or reduce threats.	Bunea (2019b)

#### 4. RESULTS OF STATISTICAL ANALYSIS

We calculated the Cronbach's Alpha coefficient as part of the statistical analysis of the study data to evaluate the internal consistency of the evaluation scales, as our variables were made up of numerous pieces. Cronbach's Alpha is acceptable at a value of 0.7. (Tavakol and Dennick, 2011; Bunea, 2021).

The findings we received proved the scales' reliability, as we achieved a coefficient of 0.793 for organizational readiness for procurement 4.0, a coefficient of 0.764 for circular economy openness, and a Cronbach coefficient of 0.890 for the scale that represented the competitiveness variable.

Furthermore, 85 significant large enterprises were evaluated in terms of their organizational preparation for the implementation of procurement 4.0, their openness to the circular economy, and their competitiveness. Table 2 shows the descriptive statistics for the variables we used.

TABLE 2 - DESCRIPTIVE STATISTICS FOR ORP4.0, CEO, AND COM

	N	Range	Min	Max	Mean	Standard Deviation	Variance	Skewness	Kurtosis
<b>ORP4.0</b>	85	1,20	2,40	3,60	2,98	0,442	0,196	0,50	-1,455
<b>CEO</b>	85	3,00	1,00	4,00	3,00	1,055	1,113	-1,191	-0,106
<b>COM</b>	85	1,40	2,60	4,00	3,50	0,558	0,312	-0,643	-1,330

Source: authors using IBM SPSS 26.0

The assumption of the normal distribution of the data was first evaluated before using a two-way moderated multiple regression analysis to test the study hypotheses. For two reasons, we found that the assumption was met. To begin, we can see in Table 2 how the data were related with skewness less than 2.0 and kurtosis less than 9.0. (Schmider et al., 2010). Second, we used the Shapiro-Wilk test to determine if the data was normally distributed and if the p-value was greater than .05. The null hypothesis for this test was that the data did not deviate statistically substantially from a normal distribution. Given that the Shapiro-Wilk p values for all variables are more than .05, we have failed to reject the null hypothesis; hence, we may infer that the data were normally distributed (Shapiro and Wilk, 1965; Razali and Wah, 2011).

The two-way moderated multiple linear regression was used to investigate how well circular economy openness predicted competitiveness, as well as to explore the moderating influence of organizational preparation for procurement 4.0 on this connection. To minimize significant multicollinearity with the interaction term, the moderator was coded by multiplying the independent variable (CEO) and the moderator (ORP4.0) (Aiken and West, 1991).

As shown in Table 3, the predictive power of the model increased, the adjusted R square improved by 1.5 percent and the value of F for ANOVA being statistically significant.

TABLE 3 - RESULTS OF THE TWO-WAY MODERATED MULTIPLE LINEAR REGRESSION

Mode I	R	R Square	Adjusted R Square	Std. Error	Change statistics			Sig. F Change	
					R Square Change	F Change	df1		df2
1	.987 <sup>a</sup>	.974	.974	.09074	.974	1548.931	2	82	.000
2	.994 <sup>b</sup>	.989	.989	.05984	.015	107.511	1	81	.000

ANOVA F Model 1 (2, 82) = 1548.931 (.000)\*\*; ANOVA F Model 2 (3, 81) = 2409.742 (.000)\*\*  
a. Predictors: (constant), ORP4.0, CEO  
b. Predictors: (Constant), ORP4.0, CEO, CEO\_by\_ORP4.0

Variable	Estimated coefficient	Standard robust error	P-value
CEO_by_ORP4.0	.514	.050	.000

Source: authors using IBM SPSS 26.0

The findings showed that the Adjusted R Square for our equation in Model 1 was .974, indicating that CEO and ORP4.0 predicted 97.4 percent of the variation in COM. This is a strong association, according to Cohen (2013). In terms of Model 2, the adjusted R square is .989, indicating that CEO and ORP4.0 predict 98.9% of the variation in COM. This is a strong association, according to Cohen (2013). When we include the moderator variable, which reflects the CEO interaction effect by ORP4.0, we find a change in the R square.

Additionally, Table 3 summarizes the impact of the interaction. The bootstrap 95% confidence interval for the CEO slope by ORP4.0 to predict COM varied from .415 to .612. As a result, for every one-unit increase in the moderator variable, COM rises by approximately .415 to .612 points. Furthermore, given a 5% threshold of significance, the F-test is statistically significant for both models. This suggests that the variance in COM is justified by both the independent factors and the moderator variable as a whole.

Using the two-way moderated multiple linear regression analysis, the model claims, on the one hand, that CEO and ORP4.0 may characterize changes in COM and that there is a positive association between the variables. The model, on the other hand, asserts that the moderator variable, which was coded to show the interaction effect, can also describe changes that would appear in COM, and that it actually significantly increases the predictive capacity of the model, potentially moderating the effect between our variables.

We also provide a graphical representation of the moderating effect. The moderating impact of a variable, such as mediation, can be investigated and validated using hierarchical linear regression, as seen above. We remark that we utilized IBM SPSS program to center the variables and produce the interaction effect for this purpose.

Centering and interaction terms were generated automatically in SPSS using Andrew F. Hayes' PROCESS v4.0 (Hayes, 2017). We display the interaction points (see Figure 2) as a consequence of using the above-mentioned approach to understand the interaction.

Examining the interaction plot, we can detect an amplifying impact known as an enhancing effect, such that as CEO and ORP4.0 grew, so did the company's competitiveness, at all levels, particularly at low CEO levels. Organizations with a high level of openness to the circular economy and a high level of organizational readiness for procurement 4.0 performed the best. Furthermore, we observed similar competitiveness at all levels of organizational readiness for procurement 4.0 at high degrees of circular economy openness.



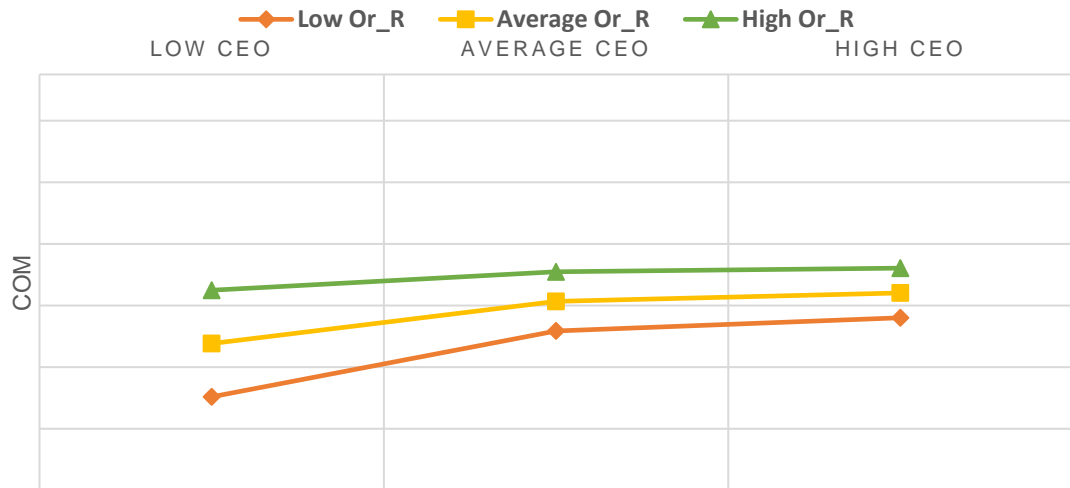


FIGURE 2 - INTERACTION EFFECT

Source: authors based on Andrew F. Hayes' PROCESS v4.0

## 5. DISCUSSIONS

This study involved testing the hypotheses that resulted from the study of the literature that assumed that the competitiveness of an organization may be the result of managerial perception factors on the circular economy, but also organizational factors related to preparation for the implementation of Procurement 4.0. In this regard, we performed a moderated regression analysis to test the moderating effect of organizational readiness for procurement 4.0 on the relationship between circular economy openness and organizational competitiveness. The results we obtained indicated that the openness of the circular economy has the ability to describe the changes that occur in the company's competitiveness. Specifically, there is a positive influence between the two variables, so that as the level of openness of managers about the circular economy increases, so does the competitiveness of the organization to which they belong.

On the one hand, this result indicates that the managerial openness to the adoption of practices specific to the circular economy as well as the level of understanding of the benefits they bring contribute to an improved performance of the organization. At the same time, this result strengthens the arguments brought by research such as those carried out by Urbinati et al. (2017) and Ünal et al. (2018), which highlighted that the level of openness and involvement of management is very important to successfully implement environmental initiatives. This result also confirms the assumption of De Angelis et al. (2018) that the basic purpose of the circular economy is to extract as much value as possible from items through a compact, closed-loop of restoration and reuse in order to maximize financial and environmental efficiency, thus resulting in increased competitiveness. Thus, the first hypothesis of the study is H1. Managers' openness to the circular economy (CEO) is a predictor of the organization's competitiveness (COM) is supported.

From another perspective, the results of our study indicated an enhancing moderating effect of organizational readiness for procurement 4.0 on the relationship between managers' openness to the circular economy and competitiveness. This specific result strengthens the arguments presented in the research of Nara et al. (2021), who identified that interaction between technology, the Internet, knowledge, and humans will increase efficiency, advance financial elements, and foster contemporary growth, all of which are included in the Procurement 4.0 process.

Moreover, Bag et al. (2020) found that the procurement 4.0 approach has a favorable link with buyers' intentions to optimize business processes, with the potential to increase competitiveness, which is consistent with our findings. Thus, we consider the hypothesis - H2. Organizational readiness for procurement 4.0 (ORP4.0) has a favorable impact on the path connecting circular economy openness (CEO) and organizational competitiveness (COM).

The main findings of this study focus on the importance of the level of openness and knowledge of managers about the principles of the circular economy to increase organizational performance. Furthermore, the level of preparation of the organization for the transition to current procurement practices through Industry 4.0, called procurement 4.0, strengthens the effect that the level of openness and knowledge of managers about the principles of the circular economy has on the competitiveness of the organization.

Thus, we provide important insights for managers on a potential path to performance in today's competitive environment, which requires both sustainable practices and adaptation to specific Industry 4.0 requirements in a context of the circular economy for the procurement function.

## 6. CONCLUSIONS

The objective of this study was to assess whether organizational readiness for procurement 4.0 has an impact on organizational competitiveness in the context of the circular economy. The study also looked at the role of organizational readiness for procurement 4.0 as a moderator of the relationship between the openness of the circular economy of the manager and the competitiveness of the company. Given the results of our study that were discussed earlier, we believe that the goal of this investigation has been achieved. Today, the procurement function is not limited to purchasing activities. More and more companies are looking at procurement functions in terms of the opportunities they can create. The digitization and implementation of rules with respect to the environment is leading more and more managers to think about Industry 4.0 opportunities and consequently Procurement 4.0.

Our study helps managers by providing a perspective on the Romanian business environment and highlights the importance of issues such as the level of openness to the circular economy and organizational readiness for procurement 4.0 for the long-term competitiveness of the organization. As a result, we have grounds to suppose that there is a need for increased awareness about the benefits of procurement 4.0, as it provides transparency for supply chain collaboration, factual information that could be used in the process of innovation, and improves employee know-how, all of which are critical in the context of the circular economy and achieving the organization's sustainability objectives.

The main limitation of this study is that it is focused exclusively on large Romanian companies. We see this limit as an opportunity for future research that could take the conceptual framework and test it in different contexts, for businesses in other countries and for companies of various sizes, this study paving the way for this research opportunity in a more general sense.

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