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Circular Economy Practices in Food Supply Chains: A Catalyst for Improved Environmental Performance Through Sustainability Orientation

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Abstract

The objective of this paper is to examine the impact of circular economy practices (CEP), sustainability orientation (SO), and environmental performance (EP) within food supply chain firms in Pakistan. In order to test the proposed hypotheses, the data were gathered from 229 participants. In the current research study, we used quantitative research and structural equation modelling SEM applied in the SmartPLS version. The current research results suggest that CEP positively and significantly impacts SO and EP. In addition, it was recommended that the SO relationship between CEP and EP be established for Pakistan's in-food supply chain firms as a developing country. Thus, extending the Resource-Based View (RBV) theory, it is possible to indicate that circular economy offerings are valuable resources for obtaining competitive advantages in food supply chain firms. In that regard, the study offers managerial implications for the organization to implement circular economy strategies and foster a more sustainable culture. In conclusion, this research pays attention to the fact that organizations, businesses and industries must embrace circular economy and sustainability values to reduce their negative impact on the environment and work towards sustainable solutions in the long run.

Keywords: *Circular Economy Practices; Environmental Performance; Food supply chain; Sustainability Orientation*

Introduction

The shift towards a sustainable food system that implies a new state of businesses requires the introduction of the principles of a circular economy where waste is minimized and resources are used as effectively as possible (Ciliberto et al., 2021). Specifically, circular economy activities within the food supply chains focus on closed-loop production and resource recovery systems and the overall waste reduction efforts of the food sector. Therefore, CEP are strategies and approaches geared towards reducing waste and improving the use of resources in manufactured operations through the concepts of produce-use-reuse of products and components (Eduljee, 2023). This can be compared to the so-called linear economy, also known as 'take-make-dispose', which results in a high amount of damage to the environment (Junejo, Hossain, et al., 2024). EP, therefore, refers to the effects of the firm's operations on the environment in terms of sustainability; effects in this case include resource use, wastes produced, and emission of greenhouse gases (Hassan et al., 2024). There is growing evidence of the relationship between the CEP and EP since applying these practices would improve the overall performance by minimizing the environmental effects and improving the management of the resources (Dragomir, 2018), (Johnstone, 2020), (Rodríguez-Espíndola et al., 2022). However, there is a lack of connection between how these two practices

relate to enhancing environmental performance, focusing more on the food supply chain sector. To that end, analysis of these two variables can be closely intertwined since identifying factors contributing to the development of sustainability strategies may help tackle enormous existing environmental issues and enhance the economy's resilience.

In addition, SO is the extent to which an organization incorporates environmental, social, and economic aspects into its strategies and operations (Rehman et al., 2022). This orientation incentivizes firms to think long-term to integrate ideas into sustainability instead of caring for quick, profitable. SO is positively related to EP since business organisations possessing a sustainability-oriented attitude are more inclined to integrate processes that deliver less waste and fewer emissions (Maman et al., 2024). However, it is often the case that firms fail to realize their sustainability orientation in terms of actual environmental benefit; attributable to this fact, there is often a need for both concrete indicators to measure and practical tools to implement (Torelli, 2021). It is, therefore, essential to understand the relationship between these two variables because necessary corrections may be given for different circumstances in order to know how a well-developed sustainability orientation can drive the improvement of the environmental performance where the organization is positioned to provide solutions to the numerous environmental challenges facing the world today.

It is relevant to discuss the following reasons for focusing on developing countries' food supply chain firms, such as Pakistan. First, the agricultural sector must be addressed in the development of Pakistan as it provides work to many people and ensures the country's food supply (Ubaid-ur-Rehman et al., 2021). However, this sector is challenged by several factors, such as the availability of resources, inefficient practices and environmental deterioration, which escalates climate change consequences in society (Qureshi et al., 2021). While the country struggles with these banes, widespread application of circular economy concepts and principles is unavoidable for improving resource utilization efficiency and minimizing adverse environmental impacts. Further, Pakistan's food supply chain integrates different players, including farmers and distributors, and they need more knowledge or capacities regarding sustainability (Rasool et al., 2023). This landscape offers a promising context through which to explore sustainability orientation's impact on these firms' practises and performance. Furthermore, the socioeconomic factors of Pakistan, including but not limited to rapid urbanization and population growth, increase the pressure on sustainable food practices to provide food security (Khurshid & Abid, 2024).

The following three research questions will be addressed in this study:

RQ1: Do circular economy practices matter for environmental performance in food supply chain firms in a developing country, Pakistan?

RQ2: Does sustainability orientation matter for environmental performance in food supply chain firms in a developing country, Pakistan?

RQ3: Does Sustainability orientation mediate the relationship between circular economy practices and environmental performance in food supply chain firms in Pakistan, a developing country?

This study aims to advance knowledge of circular economy, sustainability orientation, and environmental performance in food supply chain firms in the context of a developing country, namely Pakistan. Prior literature has confirmed that CE initiatives and sustainability strategies have a direct, positive relationship with environmental performance. However, these findings are primarily from the context of developed countries where firms have higher levels of resources and standardized implementation structures available (Maman et al., 2024), (Marrucci et al., 2022a). That said, there is a significant lack of studies addressing these variables, specifically in developing

countries where challenges can differ significantly due to more complicated environments and many different regulations and market characteristics. To be more specific, concentrating on food supply chain firms in Pakistan is essential as this sector significantly impacts the country's economy and the environment (Mahmood et al., 2024). Also, this study uses a random sampling technique to increase its generalizability since past research has used convenience sampling. This will give a better and improved data sample to link with the results that will be needed in policy and practice for improving sustainability in the food supply chain, especially in developing countries (Junejo et al., 2022).

Literature review

Resource-Based View (RBV) theory

This study is based on the Resource-Based View (RBV) theory. The selected conceptual framework is focused on using and developing new resources for sustainable competitive advantage. In this case, circular economy practices are considered as the business activities aimed at reducing waste and effectively utilizing resources through recycling, reuse, and sustainable production (Joensuu et al., 2020). These practices act as the independent factors that can potentially increase environmental performance, as the latter refers to the results of a firm's activities within the context of ecological responsibility, such as waste and emissions standards (Kherazi et al., 2024). Sustainability orientation, the mediator in this study, pertains to an organization's endeavour to institute environmental, societal and economic factors into its business decisions. As the RBV postulates, possessing a sustainability orientation means a firm is more prepared to manage circular economy practices since sustainability is based on the long-term approach to resource conservation and environmental respect (Zhou et al., 2023). This orientation plays an intermediary role by determining the level of enabled with which organisations bring the circular economy practices into operation, which determines their environmental performance (Junejo et al., 2024). Hence, by developing a sustainable culture, firms can map the circular economy strategies into actual environmental results as a perspective of the constitutional complex relationships in the RBV model.

Hypothesis development

CEP

Several studies have focused on using circular economy practices and their effect on environmental performance, hence raising the hypothesis that they positively affect environmental performance (Harris et al., 2021), (Tang et al., 2022). Scholars have claimed that one has to reduce resource consumption, recover resources, and enhance sustainable production by implementing circular economy practices, resulting in decreased environmental impacts. Present research has established that companies that embrace these practices end up with better environmental standards since they cut emissions and use less water and other resources, improving their sustainability. On the other hand, some critics opine that the effectiveness of circular economy practices might be subject to conditions such as industry type, regulatory requirements and strategic organisational capacities (Peyravi & Jakubavičius, 2022). They state that it may be the case that only some firms could reap the benefits of these practices if they possess the proper infrastructure or commitment level. However, several scholars call for a more detailed analysis of the relationship between these variables, with many stressing the need to carry out additional research that is likely to establish the circumstances that make circular economy principles boost environmental performance (Marrucci et al., 2022b), (Marrucci et al., 2022a). These debates point

to the need to test and appreciate the contextual nature of the proposed positive relationship on the research agenda.

Furthermore, the hypothesis that circular economy practices have a positive relationship with sustainability orientation is consistent with the existing literature saying that these two factors are mutually related (Chowdhury et al., 2022), (Li et al., 2023). Scholars confirmed that going circular makes companies think more sustainably as the concept is built on reducing waste, optimizing resource use, and taking long-term responsibility for the environment (Zong et al., 2024). Organisations will likely increase a sense of responsibility towards sustainability and innovation when implementing circular principles at a firm level. Nevertheless, some arguments can be put forward to claim that the relationship may not be global. It is argued that organisations often engage in circular economy management, taking into account many economic benefits, including reduction of costs, while not having a sustainable outlook (Dey et al., 2022). Thus, this transactional approach to sustainability engagement may prevent a deep sustainability orientation and the range of advantages that can be derived from it. However, scholars argue for more research on the link between CEP and SO, arguing that there is a need for methodological research to unravel how these practices can help spring up an organization and orient the organization towards sustainability (Leipold et al., 2021). Such research is essential for confirming the existence of the proposed positive relationship and identifying the factors which could affect it. Therefore, based on above literature review following hypotheses have been developed:

H1: CEP positively related to EP.

H2: CEP positively related to SO.

The Mediating Role of SO

The RBV theory states that the resources and capabilities of the firm are the key components to obtaining competitive advantage and superior performance (Lubis, 2022). In this context, sustainability orientation is essential as the mediating variable. When the firms have a high sustainability orientation, they are more likely to create more value from circular economy practices to achieve better environmental outcomes (Mazzucchelli et al., 2022). For its part, the literature seeks to explain that organizations with a higher sustainability orientation are better placed to incorporate circular economy ideas into their operations and consequently improve resource utilization efficiency while lowering the adverse impacts on the environment. This alignment can encourage innovation on the way forward towards improved measures in sustainability practices (Khurana et al., 2021). On the other hand, there are arguments that mediation is only sometimes effective in strengthening the role of sustainability orientation, or its effectiveness is argued by characteristics such as the nature of the industry and organizational culture. A scholar pointed out that there is a risk that circular economy practices would bring much environmental added value (Arruda et al., 2021). However, without a profound focus on sustainability, based on the current literature, many scholars call for more extensive studies to understand the mediating role of sustainability orientation in applying circular economy strategies to improve environmental performance. Therefore, based on above literature review following hypotheses have been developed:

H3: SO positively related to EP.

H2: SO mediates the relationship between CEP and EP.

Methodology

Data collection Procedure

The data collection method for this quantitative study uses a deductive approach to the formulated hypotheses, which relate to the effects of circular economy practices, sustainability orientation and environmental performance. For primary data collection, a structured survey method will be adopted. This systematic approach, in which the researcher personally conducted face–to–face interviews, ensures a higher response rate and clarity of the questions. The target population comprises firms that are part of the food supply chain in Pakistan, while potential participants reached through firms' HR departments. A random sampling method used to identify respondents to be sampled to get 229 Number Respondents and ensure the collected information is credible. The survey instrument employs a five-point Likert scale to produce participants' views and various experiences of the constructs (Yamashita, 2022). To ensure that nobody knows who filled the survey, it will declare employee secrecy, and to meet the same standards for data protection, the survey will observe security procedures that create a culture of truthfulness.

Research instrument

Circular economy practices. Circular economy practices are best explained as business and management strategies that conserve resources and reduce waste generation within the economy (Tambovceva et al., 2021). These processes include recycling, reuse of materials, production of long-lasting products, and closed-loop production processes. The latter is the achievement of the overall objective of establishing a regenerative system, which improves the systematic, responsible use of resources and recreation of the environment. Five research items were considered from the study of (Tambovceva et al., 2021) and sample research item was "Our organization encourages visionary thinking and incentivizes technological innovation to adopt the five Rs in the supply chain. We also routinely organize education and awareness events for the majority of the strategic participants in the manufacturing value chain".

Sustainability orientation. Sustainability orientation is the level of commitment by an organization to consider the environmental, social, and economic impacts of strategic management and operational activities. Perhaps the best way it has been done is to pursue sustainability as a value, which results in innovation and the inculcation of pro-environment and social justice practices. Companies assuming a sustainability focus have a long-term vision of sustainability as opposed to a short-term profit motive and foster sustainable development within the company. Six research items were considered from the study of (Hooi et al., 2016) and sample research item was "firms that are environmentally oriented have advantages in recruiting and retaining qualified employee".

Environmental performance. Environmental performance can be defined as the observable results of an organization's functioning or activity for the natural environment. Some areas include the efficiency of resources used, the quantity of waste produced, emissions, and environmental standards. Environmental performance, as used here, is a measure of the degree to which an organization has been able to meet its environmental accountability and sustainability standards. Five research items were considered from the study of (Tambovceva et al., 2021) and sample research item was "Over the last 3 years, our organization has improved its adherence to environmental regulations".

Software tool for analysis

The decision to use SEM in Smart PLS rather than CB-SEM in AMOS can be mainly based on seven significant advantages that Smart PLS has. Smart PLS has an advantage in models with several constructs and indicators. The assumptions of multivariate normality and larger sample size are mandatory for CB-SEM, Smart PLS allows for a non-normal distribution of the data and

can provide adequate results with minor samples (Usakli & Rasoolimanesh, 2023). Besides, Smart PLS does not rely only on model fit indices but points to prediction and variance explained, making it possible for researchers to evaluate the predictive accuracies of their models. It also has a friendly graphic user interface that can enhance the model specification and visualization process, which is preferable, especially to the less statistically inclined researchers. In this respect, the considered features make Smart PLS more convenient and suitable for researchers who need to unveil and validate the multiple and intricate connections in their data (Sarstedt et al., 2014).

Results and Discussion

Reliability and validity are the significant factors that concern the research's quality and, more importantly, credibility (Rose & Johnson, 2020). Reliability, on the other hand, is the capacity of measurement to provide the same values under equal conditions and, as such, reduces or eradicates errors to make the results highly reproducible (Hodges et al., 2023). This is because consistency provides confidence in the results obtained in the data set and its predictive ability. Construct validity is concerned with the issue of whether a given test is measuring what it claims to be measuring at any given point (Flake & Fried, 2020). A valid instrument will guarantee that the results are meaningful and relevant in real-life situations and that the conclusions one can come up with are accurate. Reliability and validity work hand in hand to offer a credible paradigm for measuring the precision and coherence of research, thus leading towards the validity of the outcome of the study.

Cronbach's alpha and composite reliability are recognized coefficients for measuring reliability in measurement instruments, especially in the social sciences and psychology (Chan & Lay, 2018). Cronbach's alpha is used to assess the internal consistency of a set of items, which measures the overall consistency of this set of items as a single measure of a single construct (Schrepp, 2020). Its value should be more than 0.70, which is acceptable. On the other hand, composite reliability estimates the degree of reliability of a whole list of indicators based on their varied factor loadings in factor analysis (Hair et al., 2020). Its value should also be greater than 0. 70. Combined, these measures assist researchers in confirming that the instruments being used to gather data are accurate, reliable, and valid, making it more straightforward for the researchers to come up with valid conclusions in their given studies. All values are greater than suggested value 0.70. (See Table 1 and Figure 1)

AVE is calculated as the mean of the squared difference between each observed variable's estimated factor loading and its mean value, which is directed towards construct validity in SEM and factor analysis (Ahmad et al., 2016). It quantifies the degree to which a set of indicators by a latent variable is higher than an AVE of 0.50. In practical terms, this value is considered acceptable if it is 50 or higher, proving that the construct accounts for at least 50% of the variance. In conclusion, AVE is crucial for claim support, facilitating construct validation, quality measurement, and ascertaining assessments of theoretical frameworks in research. All values are greater than suggested value 0.50. (See Table 1)

Table 1. Reliability and Validity

Factors	**Item SPSS coding**	**Value of outer loading**	**Value of Cronbach alpha**	**Value of Composite Reliability**	**Value of Average Variance Extraction (AVE)**
	CEP1	0.868	0.863	0.901	0.647

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Circular economy practices	CEP2	0.802			
	CEP3	0.729			
	CEP4	0.817			
	CEP5	0.800			
Sustainability orientation	SO1	0.852	0.908	0.929	0.685
	SO2	0.784			
	SO3	0.850			
	SO4	0.852			
	SO5	0.799			
	SO6	0.824			
Environmental performance	EP1	0.875	0.897	0.925	0.711
	EP2	0.838			
	EP3	0.759			
	EP4	0.881			
	EP5	0.857			

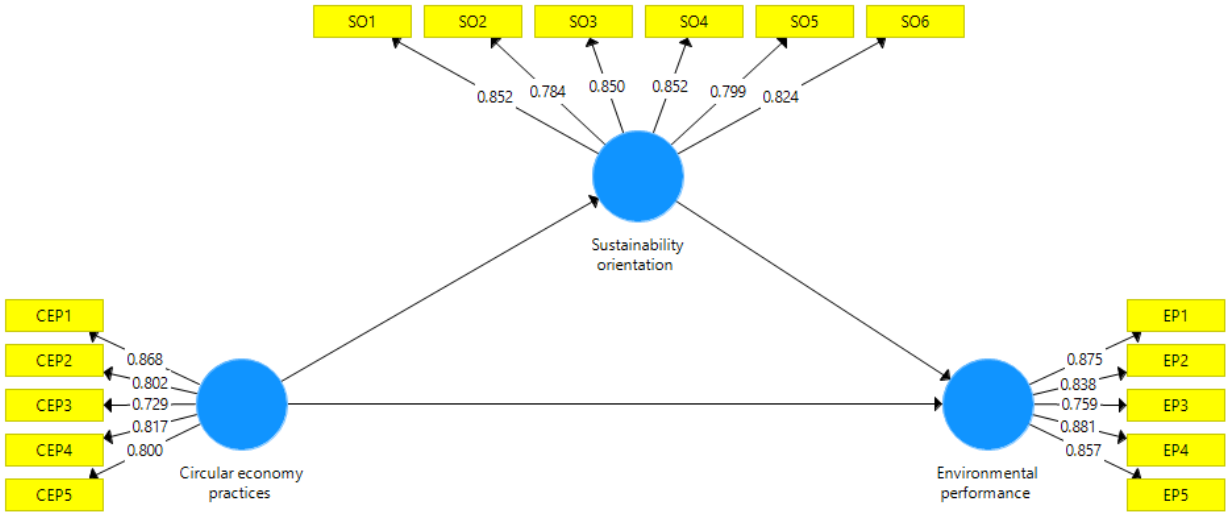

Figure 1. Measurement Model

Direct and indirect effects

The findings regarding hypothesis (H1), CEP, and EP showed a positive and significant impact. The beta value is 0. 260, and the t-value is 4.931, which is higher than 1.96. It means that the relationship is statistically significant; hence, the null hypothesis is rejected. H1 proved to be accepted. (See Table 2 and Figure 2)

The results from hypothesis testing for H2, which measures the correlation between CEP and SO, revealed a positive and significant impact with a beta value of 0.675 and a t-value of 15.675. This high beta value indicates a strong association with practice; this means that organisations that participate in circular economy practices improve their sustainability commitment greatly. (See Table 2 and Figure 2)

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Furthermore, the results for testing hypothesis H3 show the high, positive, and significant impact of SO on EP. The beta value, which has been estimated to be 0. 641, is indicated, and the t-value is 13.305. This raised beta value suggests a rather significant effect, demonstrating how organisations increased concern with sustainability brought about better environmental results. (See Table 2 and Figure 2)

The analysis of hypothesis H4 suggested that SO's mediating role between CEP and EP revealed a partial mediation effect. The beta value was 0.433, and the t-value was 10.687. It showed that sustainable outcomes resulting from circular economy activities are mediated through sustainability orientation, which implies that as organizations improve on circular economy strategies, the overall organizational sustainability orientation also improves, enhancing environmental performance. (See Table 2 and Figure 2)

Table 2. Direct and Indirect Effects

Paths	**Value of Beta**	**T-Value**	**Remarks**
Circular economy practices -> Environmental performance	0.260	4.931	Accepted
Circular economy practices-> Sustainability orientation	0.675	18.371	Accepted
Sustainability orientation-> Environmental performance	0.641	13.305	Accepted
Circular economy practices-> Sustainability orientation -> Environmental performance	0.433	10.687	Accepted

Discussion on results

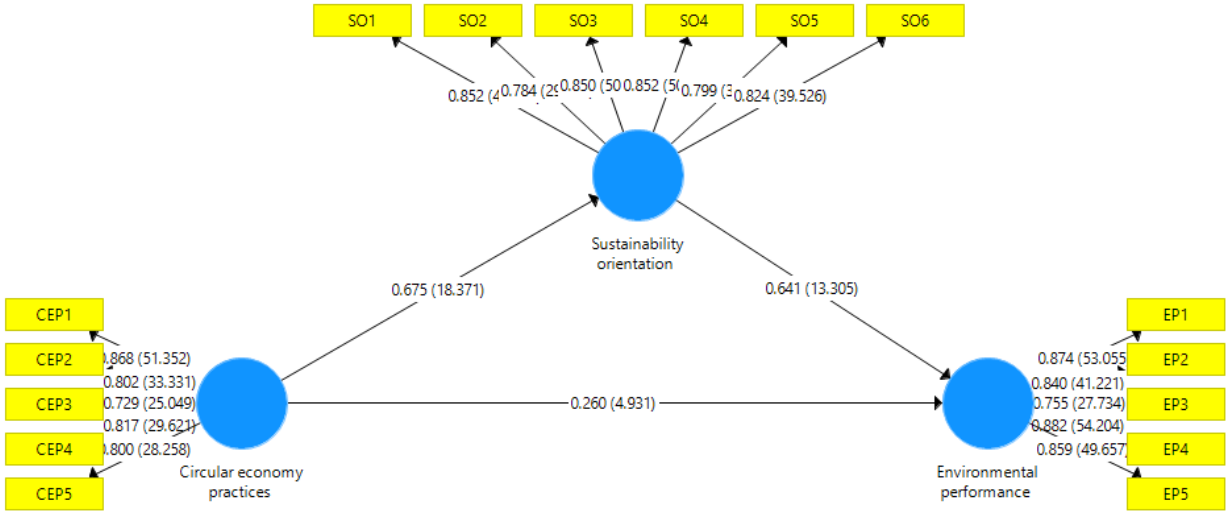

Figure 2. Structural Model

Based on this discovery, organizations implementing circular economy measures, including resource use efficiency, waste minimization and recycling, observe enhanced environmental results. This remains true of the concept that organizations must actively engage in

circular economy approaches to improve their ecological sustainability (Awan & Sroufe, 2022). In addition, this strong relationship indicates that organizations adopting circular economy practices improve sustainability efforts to a great extent. If resource usage is well conserved and practices are put in place that will favor the conservation of the environment, organizations create a long-term ecological consciousness in their members. In this case, it is crucial to make guidelines and recommendations regarding the further enhancement of the circular economy, which creates the necessary base for cultivating sustainable practices among people (Salvioni & Almici, 2020). In addition, it confirms the hypothesis that organizations in the congregation that possess a high sustainability orientation are positioned to garner superior environmental results. Sustainability commitment forces organizations to establish green performance measures, thus improving performance in ecological frameworks (Kalyar et al., 2020). This underscores the necessity of developing sustainability as a core competency of organizations that efforts to manage the environment. Finally, the authors identified some of the focuses that show that sustainability orientation forms an essential connection between implementing the circular economy strategy and the firms' environmental results. It pointed out that the circular economy enhances environmental benefits and multiplies them when recycling is 'supported' by a sustainable culture (Kalyar et al., 2020). Sustainability is highly intertwined with these constructs, and this mediation shows that the positive impacts of circular economy practices are best achieved when partnered with sustainability. Therefore, the idea is that organizations must introduce circular economy initiatives and invest in creating a sustainability mindset to achieve the most significant environmental value (Opferkuch et al., 2021).

Conclusion

The present research revealed a significant association between CEP, SO and EP. For each hypothesis, evidence was provided supporting the proposition that CEP has a positive and significant impact on EP and SO. The companies that implement the circular economy concept obtain better performativity of ecological results, and the commitment to sustainable development is enhanced, further enlarging the positive impact on the environment. The results presented in this paper showed positive and significant signs that support the drive for organisations to adopt circular economy as a concept to be implemented within organisational structures and to foster sustainable cultures within organisations. It is crucial to focus on these approaches, as contemporary environmental issues should be solved by considering further sustainable development. Through circular economy practices and sustainability orientation, organisations can transform themselves into what can be referred to as environmentally responsible organisations in their respective industries.

Theoretical contribution

This research brings a theoretical contribution by using the RBV theory while building the contexts of food supply chain firms in Pakistan. Thus, the research contributes to the methodological development of the RBV by presenting a chain of positive relationships that show that food supply organisations that engage in circular economy practices will see an improvement in their environmental performance directly and indirectly through Sustainability Orientation. Moreover, it is confirmed that sustainability orientation plays the role of mediator and changes the perception of relations between these variables: It is critical to focus on sustainability to gain the most out of circular economy strategies. This contribution becomes vital because of the tendency of mixed findings in previous studies. It provides a better understanding of the interrelation of these constructs within the context of the food supply chain. The present research links RBV theory

with research evidence to map out avenues for more investigation and application in the future, especially in terms of incorporating sustainability into resource management to improve environmental results.

Managerial Implications

The conclusions reached in this study provide several significant insights for food supply chain companies seeking to improve their environmental responsibility levels. Managers need to focus on implementing the CE strategies because these initiatives are known to impact the environment directly. Action is given through the execution of several measures, including proper waste disposal, recycling of resources, and obtaining sustainable resources. All these measures create ecological value for the organization and help it achieve organizational sustainability goals.

Secondly, this paper reveals that the organization should promote the need for a sustainability culture. The managers should ensure that sustainability is incorporated into the company by making it a tradition, education, and practice. In this way, we increase the effectiveness of the CE efforts by making sure the employees at various organizational levels are committed to the goals related to sustainability.

Further, the established mediation effect of sustainability orientation means that a practical approach has to involve both the circular economy activities and the sustainability beliefs. Managers should create guidelines for circular actions because it does not suffice to adopt a circular business model; people must also think circularly. This integrated approach could potentially enhance the level of commitment towards environmental performance within the organization.

However, it is crucial that firms track and evaluate the performance of their circular economy and sustainability activities and implementation steps with a view to auditing and changing them where necessary. In other words, analyzing performance indicators provides managers with better possibilities to improve environmental results based on existing strategies.

Future research directions

There are several directions for future research based on this study's results. First, this study targeted food supply chain firms in Pakistan, and therefore, future studies in other sectors will explore the generalizability of the relationships between circular economy practices, sustainability orientation, and environmental performance. Second, cross-country analysis may identify some sectors' constraints and standards for borrowers. Also, efficiency-generating longitudinal investigations would open up knowledge about the dynamics of implementing circular economy practices and sustainability orientation and the possibility of efficiently defining causal relations and sustainability of these practices. Third, studying external factors, including government policies, market characteristics, and consumer behaviour, might strengthen understanding of these initiatives' performance under varying conditions. Finally, the specific performance indicators for evaluating the impact of circular economy initiatives and sustainability direction should also be established and further refined to make comparisons more easily across the different contexts. In this way, these directions will allow scholars to expand their knowledge of these constructs and support the formulation of better approaches for improving environmental performance in different industries.

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