




# “Circular economy awareness, adoption, and its effects on business performance in Saudi Arabia”

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# CIRCULAR ECONOMY AWARENESS, ADOPTION, AND ITS EFFECTS ON BUSINESS PERFORMANCE IN SAUDI ARABIA

## Abstract

A circular economy has become an innovative business model, though contentious, to replace a linear economy in achieving sustainable and efficient production. This study aims to investigate the level of awareness, adoption, and effect of factors driving the circular economy adoption on the financial performance of micro, small, and medium enterprises (MSMEs) in Saudi Arabia. The survey was conducted among 301 MSMEs, and the method of logistic regression was utilized for its analysis. The results revealed that the level of awareness is averagely high, with an average of seven out of 10 enterprises. However, the outcome further showed that only an average of three out of 10 had implemented a circular economy during the period of the survey. In addition, logistic regression revealed the significant influence of drivers of circular economy adoption on the financial performance of MSMEs. The following drivers of circular economy adoption have a great likelihood and significant effect on the enterprise's financial performance: training of employees, availability of financial resources, top management commitment, digital technology, product/service upgrade, material generated/buy back cheaper to use, and pressure from people. This is based on the outcome of logistic regression of the survey conducted on the factors driving circular economy adoption in the previous literature. However, the results revealed that regulatory incentives toward the environment and pressure from government and companies are not significant. Hence, this study provides policy implications for stakeholders in the circular economic system.

## Keywords

micro, small and medium enterprises, circular economy, financial performance, logistic regression, sustainable development, environment, carbon emission, scarcity, Saudi Arabia

## JEL Classification

D12, D22, E32

## INTRODUCTION

The world is faced with numerous environmental challenges affecting its ecosystem, and transitioning toward a sustainable system has been a herculean task globally. Many countries, including the Kingdom of Saudi Arabia (KSA), have developed various strategies for transitioning to a more sustainable system. The KSA's Vision 2030 revolves around energy transition, economic diversification, and, ultimately, sustainable development (Samargandi et al., 2024). The level of production and consumption among the firms and households in KSA is huge as the country accounts for a larger share of the economy and population in the Middle East and Gulf Region. This ordinarily results in the generation of huge used-material and consumable wastes, and most of the wastes generated from the goods produced/consumed are disposed of in landfills, contributing to environmental degradation following the traditional linear economic system. The linear economic system allows wastes to be generated from the production of goods, and these wastes are disposed of into the environment, exacerbating greenhouse gas emissions as well as creating a scarcity of resources



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### Conflict of interest statement:

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(Dey et al., 2022). It primarily entails the “take-make-consume-dispose” model, which has led to a great waste of natural resources, leaving a long-term devastating effect on the environment (Sarfraz et al., 2023). However, circular economy emerged as a novel approach to reconciling the conflict between environmental constraints and economic expansion (Geissdoerfer et al., 2017). This economic model aims to maximize the value of products, materials, and resources by minimizing waste generation and promoting their reuse, reduction, and recycling (Nechifor et al., 2020). A circular economy ensures closing the loops of materials that reduce the raw materials needed to produce new ones and eliminate waste generation. The regenerative and restorative elements make a circular economy appealing for the firms to adopt (Uhrenholt et al., 2022), as it reduces the scarcity of their resources, which were earlier challenging to commonly access, especially during economic and environmental turbulence. This serves as an alternative system that creates a value chain that cannot be underrated in the implementation of sustainable development programs.

Meanwhile, micro, small, and medium enterprises (MSMEs) occupy a strong position in any country as they contribute largely to wealth creation, employment generation, and national outputs (World Bank Group, 2019). These enterprises contribute largely to the production of goods in an economy and invariably generate a large proportion of carbon footprint in the environment. SMEs jointly contribute approximately 50% of the greenhouse gas emissions of the business sector, and many of them have not started taking appropriate steps toward carbon footprint reduction (OECD, 2022).

A circular economy could be strategic in ensuring that a firm competes favorably in the industry through the provision of green products to customers (Amin & Oláh, 2024; Mishra & Yadav, 2021). This could enhance business performance by increasing company turnover and profitability. Despite the significance of circular economy practices, the concentration of their implementation and research has been skewed toward the developed nations (Halog & Anieke, 2021; Marino & Pariso, 2020). Though little research has highlighted the importance of a circular economy to business performance, there is a paucity of studies in this area in the Gulf Region, where Saudi Arabia is located.

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## 1. LITERATURE REVIEW

This study adapts the theory of resource-based view (RBV), which postulates that the success of a firm depends on the resources and internal capabilities it possesses to acquire various technologies and strategies to favorably compete in its business environment (Barney, 1991). This implies that the possibility of acquiring new technologies depends on the internal capabilities of firms. A firm could assimilate, adapt, and deploy a circular economy in its operation as a means to achieve a competitive advantage over other firms through the provision of green and low-carbon products (Yin et al., 2023; Akinwale, 2018). There are empirical studies that have investigated the awareness and implementation of circular economy in a firm to boost their business performance (Mora-Contreras et al., 2023). However, circular economy practices have been reported more among large-sized enterprises, with less attention given to micro and small enterprises (Ormazabal et al., 2018). This is connected with the additional

costs and investments that are required for circular economy implementation at the firm level, but many small and medium enterprises (SMEs) perceive these investments as unprofitable (Rizos et al., 2016). Nevertheless, SMEs have started implementing a circular economy in recent times as a result of their increased awareness, customers' requests for green products, and government regulations, among others. In the study conducted by Akinwale (2023) among Nigerian SMEs, the outcomes found the circular economy awareness level to be moderately high, though its adoption was low. Moreover, the results revealed financial resources and technology as the main determinants of circular economy adoption among the Nigerian firms surveyed.

Nudurupati et al. (2022) investigated the circular economy acceptance and implementation in the Indian manufacturing industry. The outcomes showed that the paucity of digital technology, inadequate skills, and lack of cooperation among the various stakeholders in their supply chain affect the

acceptance of a circular economy. The study also confirmed competitive advantage, customer pressure, and government legislation among the determinants that drive circular economy acceptance. Similarly, Liakos et al. (2019) assessed 103 manufacturing firms in the UK and indicated that while six out of every 10 firms are familiar with the circular economy concept, one-half of the firms tried to make their goods reusable, and only approximately one out of 10 successfully implemented circular economy in their value chains.

Ngan et al. (2023) explored the awareness and factors impeding circular economy practices in Malaysian manufacturing firms. The outcomes revealed that two out of three firms surveyed are aware of circular economy concepts and have a great understanding of risk factors connected with the costs and scarcity of raw materials in the value chain. The main factors affecting circular economy implementation are finance, technological capabilities, industrial support, green-growth policies, and organizational and institutional factors. Ting et al. (2024), using the theory of planned behavior, analyzed the responses of 102 Malaysian firms regarding the factors affecting circular economy implementation. The outcomes of the partial least squares (PLS) method revealed the importance of internal and external stakeholders, government commitment, and alternative green finance toward the successful implementation of a circular economy in the value chain.

Jabbour et al. (2020) highlighted the importance of stakeholders in driving circular economy practice among Brazilian companies. The study revealed that internal factors (such as management support, technology, organizational change and culture, skilled labor, and shareholder pressure) are more implicit in driving circular economy practices than other factors. Klein et al. (2022) investigated public enterprises in Portugal. The outcomes reflect a low level of adoption in buying reproduced or used materials and cooperation among enterprises on green initiatives. However, survey enterprises have fairly implemented the collection of waste materials, recycling, and technology deployment. In addition, top management assurance, regulatory incentives, and financial support have been ascertained as determinants of circular economy implementation among enterprises. John et al. (2023) found

that competitive advantage, government policy and support, service delivery, and personnel management are critical factors influencing the transitioning of construction firms toward circular economy implementation and growth of market share.

The world is currently facing a challenge where production resources are finite and cannot be easily replaced; thus, various stakeholders (Sassanelli & Terzi, 2023) require careful resource management. The competitiveness that circular economy practices bring forth through the elimination and/or reduction of the scarcity of resources and costs of materials associated with production in the value chain improves the business performance of a firm. Whether or not a circular economy contributes to a firm's performance has generated contentious debate within the last decade. Triguero et al. (2023), in their study among 300 firms in Spain, found that the circular economy positively influences the economic performance of surveyed firms. Rosa and Paula (2023) conducted a study among small and medium-sized enterprises in Europe using the data from Flash Eurobarometer and the EUROSTAT database. The results revealed that firm strategy, technical skills, and financial capacity significantly influenced circular economy adoption, which afterward impacted firm financial performance. Feng and Goli (2023) surveyed 126 firms using a mathematical model to estimate the effect of circular economy implementation on financial outcomes. The result found that the adoption of circular economy practices has a significant effect on the financial performance of companies. Another study conducted in 28 European Union (EU) countries by Moric et al. (2020) analyzed the impact of the different phases of the adoption process of circular economy on firm performance. The results indicate that the performance of firms in various categories of circular economy adoption has a significant effect on firm performance, but the performance of firms just planning to implement circular economy did not have a significant influence on firm performance. This result infers that a firm improved its performance through circular economy adoption, but those at the higher level of adoption were able to improve their performance than those at the lower level of adoption. Furthermore, the performance of those firms that are planning to adopt but have yet to implement any circular economy practice is not significantly different from the performance of the non-adopters. This further corroborates that the

firms at the planning stage have not yet acquired the necessary skills, expertise, and equipment related to circular economy, which are needed to improve firm performance. Meanwhile, D'Angelo (2022) used the self-determination theory to examine the influence of the circular economy on firm performance among SMEs in European countries. The results found that the implementation of some circular economy practices influences a firm's economic performance two-fold, indicating an inverted U-shaped relationship. Specifically, while increasing some circular economy activities positively influences a firm's economic performance, a wider implementation may negatively affect operations and, subsequently, business performance. In addition, Mazzuchelli et al. (2022) studied manufacturing firms in Italy and their circular economy and performance. The structural equation model analysis indicates that the circular economy (reuse and recycling) has a significant impact on financial performance through brand reputation. Although 'reduce practice' was not significant in influencing financial performance through brand reputation, it has a direct significant effect on financial performance in Italy's manufacturing industry. Meanwhile, Sarfraz et al. (2023) assessed circular economy and financial performance among 411 firms with headquarters in European G7 member countries using a multivariate econometric estimation. The results indicate that while circular economy practices seem to reduce the cost of their operations and are found to be significant, the impact of circular economy on financial performance cannot be said to be the same. Resource reuse has negative and insignificant effects on financial performance, while waste recycling has insignificant positive influences on firm performance. This indicates that a circular economy has a relatively marginal impact on the firm's financial performance. Furthermore, Moric et al. (2020) accentuated that firms transitioning from a linear to a circular economy can only reap the full gains in the long run as it takes time for this process to generate significant returns for firms.

Chen and Dagestani (2023) targeted the case of China via panel data from Chinese-listed companies for the period 2009–2019. The study affirmed the significant impact of the circular economy on firm performance, with innovation and digital transformation playing major roles in such impact. The circular economy seems to have a larger impact on the performance of large enterprises compared

with smaller enterprises. Similarly, Agrawal et al. (2022), in their bibliometric study on circular economy and firm performance, found that digitalization and customer involvement are critical in using circular economy to drive business performance. Chowdhury et al. (2022) explored the relationship between internal organization factors (leadership, innovation capability, culture, and skills and competencies), circular economy, and performance among the employees of small and medium enterprises in Vietnam. The outcomes of the structural equation modeling (SEM) indicate that organizational leadership facilitates innovation capability and culture, which drive business performance in the surveyed SMEs. However, the skills and competencies of employees were not significant in influencing circular economy practice toward business performance.

Kwarteng et al. (2022) assessed 617 enterprises in Ghana and confirmed the positive impact of circular economy implementation on financial performance with organizational culture playing a significant role in strengthening this impact. Dong et al. (2022) conducted a study on the effect of circular economy on business performance among 295 firms in China using reduce, reuse, and recycle of materials as proxies for circular economy. The outcomes found a positively significant influence of circular economy implementation on business performance among the surveyed firms.

Although there are various studies on circular economy awareness and adoption, but there are scanty empirical studies (Govindan & Hasanagic, 2018) with varying results on the effect of circular economy implementation on the firm's financial performance. The results of the impact of the circular economy on firm performance continue to be mixed and unclear, as shown in the literature. Moreover, the study on circular economy and firm performance is underexplored in Saudi Arabia. Hence, the purpose of this study is to examine the extent of awareness and adoption of circular economy among the MSMEs as well as the effect of circular economy drivers on firm performance in Saudi Arabia.

In line with the literature review and considering the research objective, this study hypothesized the effect of the following drivers of circular economy adoption on firm's financial performance:



- H1: *Financial resources have a positive and significant influence on the firm's financial performance.*
- H2: *Environment has a positive and significant influence on the firm's financial performance.*
- H3: *Digital technologies have a positive and significant influence on the firm's financial performance.*
- H4: *Cheaper to use has a positive and significant influence on the firm's financial performance.*
- H5: *Top management commitment has a positive and significant influence on the firm's financial performance.*
- H6: *Pressure from other companies has a positive and significant influence on the firm's financial performance.*
- H7: *Pressure from people has a positive and significant influence on the firm's financial performance.*
- H8: *Pressure from the government has a positive and significant influence on the firm's financial performance.*
- H9: *Product/service upgrade has a positive and significant influence on the firm's financial performance.*
- H10: *Regulatory incentive has a positive and significant influence on the firm's financial performance.*
- H11: *Training has a positive and significant influence on the firm's financial performance.*

## 2. METHODOLOGY

This study utilized a survey (Appendix A) to obtain information from the owners/managers of MSMEs regarding their awareness, factors influencing the adoption of a circular economy, and their impacts on financial performance. The survey is based on some of the previously related empirical studies (Dey et al., 2002; Klein et al., 2022;

Calzolari et al., 2021). This study focused on the eastern province of Saudi Arabia, which is one of the main commercial hubs of the country, where indigenous and international firms are located and carry out their business operations. The research instrument is similar to the ones used in a few previously related studies but was slightly modified to suit the peculiarities of Saudi Arabia's local environment. The instrument was validated by two academics who specialized in energy and supply chain management and three enterprises to ensure its proper formulation as related to the local community. Furthermore, ethical clearance (IRB-2024-14-183) was obtained from Imam Abdulrahman Bin Faisal University's Standing Committee for Research Ethics to ensure that the analysis follows the highest standards of ethics and professionalism as well as protect the interest of participants in the survey.

The survey instrument was administered between March and April 2024 and comprises three segments. The first segment gives general information about the respondents and their firms, including their turnover, without their specific names to maintain the anonymity of the firms and the respondents. The second segment provides information regarding the firm's general awareness of the circular economy system and its adoption level. The last segment involves factors that drive the circular economy implementation in their enterprises. Some of the questions are measured with binary responses, while all the questions in the third segment relating to the drivers of circular economy adoption were measured on a five-point Likert scale.

Sampling involves both purposive sampling and simple random techniques. Purposive sampling was applied to concentrate on the MSMEs in the Eastern province where large number of such enterprises are concentrated. In addition, simple random technique was applied to obtain information from the owners of such enterprise without any interest in a particular enterprise.

The variables used in this study to explore the impact of the circular economy on the financial performance of MSMEs in Saudi Arabia are measured using an ordinal scale. The dependent variable is proxy by the monthly turnover categorized

into four categories (1 = Less than SR 50,000; 2 = SAR 50,000 and SAR 100,000; 3 = SAR 100,000 and SAR 500,000; 4 = Above SAR 500,000). The independent variables include top management commitment to circular economy, financial resources available for the firm to implement circular economy, regulatory incentives, environment, product/service upgrade, pressure from government, pressure from other companies, pressure from people, deployment of digital technology to support circular economy, and training of employees on circular economy and sustainable development related activities. These independent variables are assessed on a five-point Likert scale.

The total number of responses after removing the erroneous ones is 301. This sample size of 301 is adequate to carry out quantitative analysis considering the number of factors in the study (Hair et al., 2011). Both descriptive (frequency) and quantitative (logistic regression) methods are utilized for proper analysis. Logistic regression is suitable for analyzing data where the dependent variable is categorical and is in an ordered form (Brooks, 2019). So, the logistic regression is used to analyze the effect of each of the independent factors on turnover in terms of likelihood and significant impact.

### 3. RESULTS

Table 1 reveals that the majority (73%) of owners established their firms within the last 10 years, while 17% started theirs between 10 and 20 years, and the least (10%) of them had been operating their business for more than twenty years. This re-

flects that the MSMEs consist of both the recently established and the old enterprises, and this signifies that the survey cuts across a diverse spectrum of enterprises. Table 1 also shows that while the majority of the enterprises (44%) are small, 34% are micro, while 22% are medium enterprises. This indicates that micro and small enterprises are the main constituents of the MSMEs in Saudi Arabia.

Table 1 shows that the majority (42%) record a sales figure between SAR 100,000 and SAR 500,000 (equivalent to 26,700 and 133,300 USD), 35% generate between SAR 50,000 and SAR 100,000 (equivalent to 13,300 and 26,700 USD), while the least of them record monthly sales figures above SAR 500,000 (12.6%) and less than SAR 50,000 (10.3%), respectively. The monthly turnover correlates with the size of the firm since the majority are micro and small enterprises. This clearly shows the financial performance of the sampled MSMEs in terms of their monthly turnover. Table 2 reflects the business industry distribution. The majority of the enterprises are in construction (20.3%), services (16.3%), IT and related businesses (14%), trading (10.6%), tourism (9.3%), manufacturing (5.6%), agriculture and catering (5.3% each), medical (3%), and pharmaceutical and food spheres (2.7% each).

The background information about the owners of the enterprises is quizzed in Table 3. The average age of the owners is between 25 and 60 years (81.1%); specifically, 31% of them are between 35 and 44 years old, 27% are between 25 and 34 years old, and 24% are between 45 and 60 years old. Meanwhile, 11% are less than 25 years and 8% are above 60 years. This is expected as the majority of those less than 25 years old are either in

**Table 1.** Characteristics of the enterprises

Characteristics	Description	Frequency	%
Years of operation	Less than 2	59	19.6
	Between 2 and 5	76	25.2
	Between 5 and 10	85	28.2
	Between 10 and 20	52	17.3
	Above 20	29	9.6
Size of the enterprises	Less than 10 employees	101	33.6
	10-49 employees	58	22.6
	50-199 employees	132	43.8
Monthly turnover	Less than SAR 50,000	31	10.3
	SAR 50,000 and SAR 100,000	107	35.1
	SAR 100,000 and SAR 500,000	126	42.0
	Above SAR 500,000	37	12.6

**Table 2.** Nature of enterprise businesses

Business operation	Description	Frequency	%
Nature of business	Trading	32	10.6
	Manufacturing	17	5.6
	Tourism	28	9.3
	Agriculture	16	5.3
	Catering	16	5.3
	Medical	9	3.0
	Pharmaceutical	8	2.7
	Food	8	2.7
	Services	49	16.3
	Construction	61	20.3
	IT and related businesses	42	14
	Clothing	5	1.7
	Others	10	3.2

college or just trying to set up their businesses after college, whereas those above 60 years old are already retiring and leaving the businesses for their children and relatives. This indicates that 81% of the owners are very active and could contribute significantly to the top decision-making in the enterprise as they are in their prime years. Approximately 56% of the respondents are male, while 44% are female. Although it is expected that men dominate the ownership of enterprises in KSA, but there has been an increasing participation of women in the economic activities in line with Vision 2030. This explains an increasing number of female ownership of enterprises. Table 3 also reveals the highest academic qualification of the owners of enterprises. The majority (36%) have a Bachelor's degree, the least of them have a Primary School Certificate (4.7%), and none have no formal education (0%).

Table 4 reveals the extent of MSMEs' awareness of the circular economy. The majority of the respondents claimed that they are aware at medium (34%) to high (26%) levels. 20% and 8% are aware of circular economy at low and very low levels, respectively; 12% are aware at very high levels. In addition, 35% of the enterprises reuse their generated wastes within their value chain, 28% search for other companies that could use them and transport them to such companies, and 37% claim that they dispose of the waste generated in the landfill site. The result of awareness of the 3R (reuse, reduce, recycle) concept of the circular economy also shows that 76% are aware of the reduction of waste during production, 72% are aware of the reuse of waste, and 72% are aware of recycling waste for further production. Next, 34% claimed that they actually purchase waste materials from another company to produce their goods,

**Table 3.** Information about the owners

Characteristics	Description	Frequency	%
Gender	Male	169	56.1
	Female	132	43.9
Age (in years)	Less than 25	32	10.6
	25-34	81	26.9
	35-44	92	30.6
	45-60	71	23.6
	Above 60	25	8.3
	Academic qualification	Ph.D.	17
	Master	34	11.3
	Bachelor	107	35.5
	Diploma	55	18.3
	Technical college	29	9.6
	High school certificate	45	15
	Primary school certificate	14	4.7
	No education	0	0.0



and 37% claimed that their enterprises buy/take back their used goods to reuse in their value chain. Furthermore, the level of implementing circular economy at operational and strategic management levels was also enquired; the majority asserted that they implemented circular economy at the medium level at both strategic (37%) and operational (34%) levels. This also implies that circular economy practices have not been considered fully for use at the operational and strategic management levels of the enterprise.

**Table 4.** Awareness of circular economy

Respondents' characteristics	Description	%
Awareness of the circular economy	Very high	12
	High	26
	Medium	34
	Low	20
	Very low	8
Treatment of the firm's waste generation	Dump at a landfill site	37
	Reuse	35
	Transfer to another enterprise that could use it for further production	28
Awareness of the 3R concept	Reduction (waste reduction in material usage during production)	76
	Reuse (waste reuse by a company for its own production)	72
	Recycling (waste recycling to produce another product)	72
Adoption of the circular economy	Buy waste materials from another enterprise	34
	Buy/take back enterprise's used goods to reuse	37
Strategic management	Strategic management level	37
	Operational management level	34

Table 5 shows the factors influencing the circular economy. The logistic regression revealed that all the factors considered in this study have a positive influence on the enterprises' financial performance. Training (0.32), top management commitment (0.26), product/service upgrade possibility (0.24), availability of financial resources (0.22), cheaper to use (0.20), digital technologies (0.19), pressure from people (0.19), regulatory incentives (0.14), and pressure from other companies (0.13) have high influence on firm performance. In contrast, environment (0.05) and pressure from the government (0.04) have low influence, as reflected by their coefficient values. However, only seven out of the eleven hypotheses could not be rejected, considering their significant impact on the firm's financial performance. This includes train-

ing (H12), availability of financial resources (H1), top management commitment (H5), product/service upgrade (H9), digital technology (H3), cheapness of material generated (H4), and pressure from people (H7), which have significant influences on enterprises' financial performance.

**Table 5.** Logistic regression results of factors influencing circular economy and financial performance

Factors	B	Odds ratio
Financial resources	0.2191*	1.2450
Environment	0.0596	1.0614
Digital technology	0.1902*	1.2095
Cheaper to use	0.1983*	1.2193
Top management commitment	0.2624*	1.3000
Pressure from other companies	0.1274	1.1359
Pressure from people	0.1936*	1.2136
Pressure from government	0.0435	1.0445
Product/service upgrade	0.2366*	1.2669
Regulatory incentives	0.1372	1.1471
Training	0.3248*	1.3838

Note: \* Signifies a 10% level of significance.

## 4. DISCUSSION

The issues surrounding the circular economy have become contentious in recent years, with an emphasis on environmental, social, and government (ESG) metrics to measure firm performance. The recent international climate change conference 'COP28' held in UAE also emphasized the importance of taking further action on climate change by stakeholders across the globe. This includes industrial businesses, environmentalists, governments, and policymakers, among others. The circular economy system has been acknowledged as having a great potential to reduce emissions emanating from production and business activities as well as boosting business performance through the reduction of cost and reuse of waste materials. MSMEs account for a larger percentage of companies globally and contribute largely to wealth creation and the GDP of various nations. Hence, their role in the circular economy cannot be undermined due to raw materials utilization, energy usage, employment generation, circular economy, and waste generation. It becomes crucial to examine the level of awareness and implementation of circular economy among the MSMEs as well as the effects of circular economy drivers on financial performance.

The results of this study show that female entrepreneurs are increasing rapidly in Saudi Arabia, which indicates that the efforts of the government to increase the contribution of women in economic activities, as stated in Vision 2030, are becoming promising. The constituents of the respondents include all major sectors that use materials and generate waste in their business operations, such as construction, manufacturing, agriculture, services, and catering. The results indicate that a larger proportion of the respondents are aware of circular economy at an averagely high level, and an average of seven out of every 10 enterprises are familiar with the 3R concept of the circular economy. The result is in conformity with similar studies (Ngan et al., 2023; Liakos et al., 2019).

The result also indicates that an average of three out of every 10 sampled enterprises have implemented a circular economy in their operation at both strategic and operational levels. Similar to a few other studies, the case of Saudi Arabia also reflected a great opportunity for the circular economy to be implemented at various value chains of the MSMEs' operations as the current level of implementation is low. The low level of circular economy implementation is not limited to developing and emerging economies (Nudurupati et al., 2022; Ngan et al., 2023); it also extends to developed nations (Klein et al., 2022; Calzolari et al., 2021; Liakos et al., 2019).

Therefore, the outcomes from this study contribute to the existing literature that the global level of deployment of circular economy is still in the early stages. There is a lot of effort that needs to be put in place by various stakeholders to ensure seamless acquisition, adoption, and implementation of circular economy technologies and requisite skills. Furthermore, drawing from the RBV theory, which underpins the development of a firm's resources to boost its performance, logistic regression was performed to examine the influence of some circular economy factors on financial performance. The results of the logistic regression reveal that all the factors have a positive influence on MSME financial performance, but only seven factors have significant impacts on financial performance. These factors include training (H12), availability of financial resources (H1), product/service upgrade (H9), top management commitment (H5),

digital technology (H3), material generated/buy back cheaper to use (H4), and pressure from people (H7). This reflects that training of employees is critical for the acquisition of circular economy technologies, which in turn boosts the financial performance of the firm. In addition, the availability of financial resources could easily facilitate the adoption of low-cost circular economy strategies, which could improve financial performance. Rosa and Paula (2023) also emphasized the significant impact of training and financial resources.

The commitment of the top management and digital technology in the circular economy is of great importance to financial performance. The outcomes underscored the action of the top management in implementing a circular economy as well as the utilization of digital technology to reduce energy and waste in the firm's operations (Marrucci et al., 2021; Menon & Ravi, 2021). The possibility of upgrading the product/service of the firm, as well as the cheapness of the reused materials, could facilitate easier access to materials needed and reduce the scarcity of the raw materials, which in turn generates more profits for the firms. In addition, the pressure from people as a result of the exposure of customers to a sustainable environment enhances financial performance as customers tend to request products that are circular in nature and more environmentally friendly. Some of these factors influence financial performance (Ting et al., 2023; Dong et al., 2022). Meanwhile, the study could not establish the significant impact of pressure from other companies and government, environmental performance, and regulatory incentives on financial performance as evidenced by other studies (Sassanelli & Terzi, 2023; John et al., 2023; Dong et al., 2022; Jabbour et al., 2020).

The results have policy and managerial implications, such as sensitizing and encouraging all the stakeholders, including the government, the company's top management, suppliers, customers/public, higher education and research institutions, and financial institutions, to collaborate and support the adoption of the circular economy. The intensive and continuous training of staff on circular economy, management commitment, and government support through legislation and incentives, along with access to funds and low-cost credit facilities, will ensure easier adoption of a circular

economy, which hitherto lead to improved financial performance. The management should ensure that everyone in their organization imbibes and supports the culture of sustainable development and specifically circular economy practices in the company's daily operations.

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## CONCLUSION

This study has examined the level of awareness and adoption of the circular economy as well as the effect of its drivers on the financial performance of the MSMEs in Saudi Arabia. The exploration of circular economy is crucial to achieve the United Nations' Sustainable Development Goals through sustainable production and consumption, reduction of carbon footprint, and ensuring a cleaner environment without compromising the firm's business performance. The outcomes reveal that the awareness level of the circular economy by the majority of MSMEs is from medium (34%) to high (26%). In addition, approximately seven out of every 10 enterprises are aware of the 3R (reduce, reuse, recycle) concept of the circular economy, with waste reduction being the highest one among them, and three out of every 10 enterprises implemented circular economy in their operation.

The logistic regression shows that all the factors influencing the adoption of a circular economy have a positive effect on the financial performance of an enterprise. This includes top management commitment, digital technology, availability of financial resources, training, product/service upgrade, reused material/cheaper to use, pressure from people, pressure from other firms, pressure from the government, regulatory incentives, and environmental performance. However, only seven factors have a significant influence on enterprises' financial performance. This includes training, availability of financial resources, top management commitment, digital technology, product/service upgrade, material generated/cheaper to use, and pressure from people. This suggests sensitizing and collaborating with all stakeholders regarding the circular economy, top management commitment, providing adequate training for the employees, and adequate financial resources for the firms to ease the swift adoption of the circular economy in their business operations. In addition, there is a need for appropriate government intervention, incentives, and support to encourage business enterprises to adopt and easily implement a circular economy in their value chain.

The study is limited to MSMEs in the eastern province of Saudi Arabia for a one-time period. In addition, the data were obtained from owners of enterprises or managers in charge of the business. Further studies could consider larger enterprises as well as increase the sample size by including other regions in the country. Moreover, middle-management employees should also be considered in future studies as well as comparing one period with another period instead of one-time period only.

## AUTHOR CONTRIBUTIONS

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## APPENDIX A. QUESTIONNAIRE

Dear Respondent,

This questionnaire is designed to elicit information on the awareness and drivers of circular economic system among micro and small enterprises in the Kingdom of Saudi Arabia. The circular economy is explained as an economy ‘where the value of products, materials, and resources is maintained in the economy for as long as possible, and the generation of waste is minimized.’ The wastes generated by one company are reduced, reused, and/or recycled to generate the resources or materials for reuse within the company or transferred to another company for reuse in their production or service system.

Please be assured that all information supplied is strictly confidential and will be used solely for academic purposes. The results will be analyzed and disseminated only in aggregates, and your individual response will never be shared with anyone. In addition, note that your participation in this study is entirely voluntary, and you have the right not to fill out the survey at any time if you are not comfortable with any question therein.

### SECTION A: Information about the respondents

**1. Number of years of business establishment:**

Less than 2 years  2 to 5  5 to 10  10 to 20  Above 20

**2. Age of business owner (years):** Below 25  25-34  35-44  45-60  Above 60

**3. Gender:** Male  Female

**4. Occupation:** Trading  Information Technology related business  Pharmaceutical   
Catering  Traveling and Hotel  Manufacturing  Services  Agriculture  Medical   
Construction

**5. Highest academic qualification:**

High School  Diploma  Bachelor  Technical  Master  Ph.D.

**6. In which area is your business located?** Rural  Urban

**7. Classification of monthly turnover:**

Please indicate the category you belong	Less than SR 100,000	SR 100,000- SR500,000	Above SR 500,000

**8. Classification of enterprise size (by number of employees):**

Please indicate the category of number of employees you have	Less than 10	10 to 49	50 to 199

### SECTION B: General awareness about circular economic system

**9. To what extent are you aware of the circular economic activities (such as reduction of waste, reuse, and recycling of materials) in the consumption and production of a company?**

Not at all  Low  Medium  High  Very High

**10. Are you aware of waste reduction in material usage during production?** No  Yes

11. Are you aware of waste reuse by another company for its own production? No  Yes

12. Are you aware of waste recycling when producing another product? No  Yes

13. Has your company purchased any waste materials to produce another good in the last two years? No  Yes

14. Does your company buy back or take back goods and reuse the products? No  Yes

15. Does your company recycle and/or recover material? No  Yes

16. What does your company do to the waste generated from the production processes?

Dispose of the landfill site  Reuse

Find and transfer to another firm that could use it for further production

17. Has your company ever considered a circular economy in the procurement, production, and selling of materials, products, and services? No  Yes

For each of the following statements, please tick the extent you implement any of the following (from 1, Not at all, to 5, Very High Extent)

S/N	Items	Not at all	Low	Average	High	Very High
<b>Strategy and Management</b>						
18	My company implements a circular economy at the strategic level (such as annual management plans)					
19	My company implements a circular economy at the operational level (day-to-day administrative and operational activities)					

### SECTION C: General factors that could drive the adoption of circular economic process in your company

For each of the following statements, please tick the option(s) that best describes your opinion about the factors that could drive your adoption of circular economy from 1 (Not important) to 5 (Highly important).

S/N	Items	1	2	3	4	5
20	Top management and leadership interest and commitment					
21	Availability of financial resources					
22	Application of digital technology (such as virtual meetings and smart document management) to support a circular economy in my company					
23	A good environmental and sustainability performance					
24	Regulatory incentives and favorable legislative framework					
25	Appropriate training and education of staff					
26	Cheaper to use across the value chain					
27	Longer product lifespan and reparability of the products					
28	Products or service upgrade is possible, especially for IT services					
29	Pressure from decision-makers and politicians					
30	Pressure from other companies					
31	Pressure from citizens in the country					

Thank you for participating in this survey.