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Transitioning drivers from linear to circular economic models: evidence of entrepreneurship in emerging nations

Moein Beheshti

Faculty of Economics and Administration, Masaryk University, Brno, Czech Republic

Hannan Amoozad Mahdiraji

Birmingham Business School, University of Birmingham, Birmingham, UK, and

Luis Rocha-Lona

ESCA Santo Tomás, Instituto Politécnico Nacional, Mexico City, Mexico

Abstract

Purpose – Various publications have extensively documented the advantages of a circular economy in ensuring sustainability and limiting climate change. Despite academic records emphasising the need to adopt this business strategy, entrepreneurs in developing countries prefer linear economies. This reluctance is attributable to several factors, including insufficient infrastructure and technology, limited financial access, inadequate education systems and the prevalence of informal enterprises. Therefore, a thorough analysis of the underlying economic, political and social conditions is required to identify the drivers of circular economies (CEs) and their contribution to entrepreneurship in developing countries.

Design/methodology/approach – In this study, the authors first conducted a comprehensive quantitative literature review based on LangChain to identify the critical CE drivers from the social, technological and organisational perspectives. Based on the input from the expert panel of Iranian academic and industry professionals, the authors applied an integrated fuzzy interpretive structural modelling and cross-impact matrix multiplication approach to classification (Fuzzy-ISM-MICMAC) to investigate the chronology of entrepreneurial drivers.

Findings – Level-based model results reveal entrepreneurial drivers in developing nations and their interrelationships, specifically underlining the importance of supply chain factors and stakeholder preferences. Thus, the differences between the perception of the main drivers in developed and developing economies can be identified, with the former paying particular attention to legislative and financial factors. The study's findings contribute to conserving resources, reducing waste and adopting more sustainable corporate practices, thereby assisting developing countries in achieving development goals.

Originality/value – This study employs an innovative quantitative systematic literature review approach that relies on a large language model to identify the drivers of the CE. Furthermore, it adopts a systematic approach to examine the enablers of the CE rather than a narrow and individual perspective of the entrepreneurial drivers. The study employs the fuzzy ISM MICMAC technique to showcase the prioritisation of entrepreneurial prospects in emerging economies.

Keywords Interpretive structural modelling (ISM),

Cross-impact matrix multiplication approach applied to classification (MICMAC), Fuzzy sets,

Linear economic models, Circular economic models

Paper type Original article



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Introduction

The circular economy (CE) is a cutting-edge and practical approach to waste management and resource scarcity. Its fundamental ideas include waste reduction, material utilisation and natural system regeneration (Rodríguez-Espíndola *et al.*, 2022). This business model is intended to reduce resource consumption by decreasing waste and maximising existing resources while renewing biological systems (Chen and Kim, 2019). It is an efficient and

sustainable approach to managing resources and is gaining popularity in various businesses, from fashion to manufacturing, especially in developed nations (Kirchherr *et al.*, 2017; Huysveld *et al.*, 2019). By reducing the costs associated with raw resource utilisation, adopting this strategy, unlike the conventional linear economy model, helps companies gain financial growth while reducing negative environmental repercussions and offering long-term sustainable success (Ozili, 2021).

A key factor in transitioning to the modern CE business model is a top-down corporate belief among governments, stockholders and industrial members in moving towards a green society (Maranesi and De Giovanni, 2020). Several laws and regulations, such as subsidies, facilitate manufacturing, leading to long-term sustainability and customer benefits (Haleem *et al.*, 2020). As a practical move, European nations have promoted waste reduction, recycling and resource efficiency through Sustainable Development Goals (Wackernagel *et al.*, 2017). These regulations promise industrial benefits and have positive social and environmental impacts (Olalekan *et al.*, 2019). Accordingly, green branding and a favourable image among consumers for socially and environmentally prioritising sustainability (Chamberlin and Boks, 2018) or new avenues for expanding product and service expenditure through CE are the benefits of adopting this business model.

Even though the CE has gained popularity, businesses in developing economies must continue exploring circular model ideas further. This issue must be examined through the lens of “entrepreneurship drivers in developing nations” and their “distinct business environment” (Wu *et al.*, 2021). Studies have shown that policies in developing countries prioritise short-term success in the business environment, leading to a varying focus on prioritising CE practices compared to industrialised nations (Ferronato *et al.*, 2019). Consequently, supply chain practices such as planning and sourcing differ from what we are familiar with in industrialised nations (Murray *et al.*, 2015). In these countries, KPIs are defined based on short-term economic growth rather than sustainable applications, which should be considered when seeking entrepreneurship in developing nations (Garcés-Ayerbe *et al.*, 2019).

According to Devkota *et al.* (2022), entrepreneurship in developing countries should be encouraged due to technological advancements, growing population and affordable labour costs (Foroozanfar *et al.*, 2022). Babatunde *et al.* (2021) also suggest that population growth can lead to increased consumer education and the potential for adopting green product usage. Understanding the factors that drive the transition towards a CE in developing nations is of utmost significance. These countries are primarily affected by issues such as inadequate sustainable waste management solutions and plastic waste, as Tura *et al.* (2019) reported. Additionally, the innovative and technological entrepreneurship capabilities of these nations, highlighted by Singh and Gaur (2018), further emphasise the need for research in this area.

Nevertheless, Inspired by research conducted in a developing country that attempts to move towards sustainability, with a particular emphasis on the financial challenges faced by developing countries (Khan *et al.*, 2022), it is necessary to identify and prioritise the drivers of entrepreneurship that facilitate the creation of a CE. This process will ensure that the required resources are available for successful business model adoption. Hence, this study delves into the main drivers facilitating entrepreneurship investments toward circular economies in developing countries for their unique context and the difficulties in benchmarking CE practices from industrialised nations and directly applying them to developing nations (Kiselev *et al.*, 2021).

Numerous research studies have aimed to uncover the factors that influence the adoption of CE practices (Barros *et al.*, 2021; Gue *et al.*, 2020; Qu *et al.*, 2022; Tan *et al.*, 2022; Neligan *et al.*, 2022). However, this study stands out for its focus on understanding these drivers

within the context of developing countries. Furthermore, we have utilised the ISM MICMAC approach to prioritise and map these findings, ensuring a safe implementation of CE practices in the future. Instead of the standard literature review, our research incorporates a unique review method that leverages the LangChain package to extract the initial drivers from the past decade's research results.

The following research initially examines the existing literature to identify the critical drivers of circular economies from various social, technological and organisational perspectives. As the second step, To collect the initial CE drivers, we use an expert panel of academics and industry representatives to test the theoretical foundations further. The analysis is subsequently conducted using a combination of fuzzy interpretive structural modelling (ISM) and the Matrice d'Impacts Croisés Multiplication Appliquée à un Classement (MICMAC) technique applied to the collected data on the importance and interaction between different drivers. Finally, this study compares and maps drivers in developed countries, identified through a literature review, with empirically determined drivers in developing economies.

Concerning the influence of research records, such as [Gusmerotti et al. \(2019\)](#), the following research adds to prior knowledge by identifying these drivers specifically for developing nations and indicating that they should be prioritised for implementation by practitioners in the future. From this perspective, we encourage future research to address CE entrepreneurship challenges and drivers concerning their feasibility priority. The outcomes of this analysis can provide valuable insights for business owners and policymakers to develop effective policies and procedures for developing countries to implement circular economic principles.

Literature review

The impact of entrepreneurship on promoting CE practices in emerging countries cannot be overstated ([Rok and Kulik, 2020](#)). Over the last few years, researchers from diverse fields have analysed the obstacles and motivators of CE entrepreneurship in emerging nations through socioeconomic, environmental, technological and organisational lenses ([Agyemang et al., 2019](#)). Our world is increasingly turning to a CE, and entrepreneurs have an ever-growing opportunity and responsibility to play a leading role in this movement. While there has been increased awareness of the influence of entrepreneurship on emerging countries, more research needs to be conducted to understand better how developing countries can lead to an environmentally sustainable future. Entrepreneurs, rather than governments, are trailblazers, risk-takers and changemakers. They are positioned to identify market inefficiencies and initiate solutions to meet the growing demand ([Al-Awlaqi and Aamer, 2022](#)). By adopting a circular business model, entrepreneurs worldwide can generate job opportunities, stimulate economic growth and minimise the environmental impact of production and consumption ([Cullen and De Angelis, 2021](#)).

Developing nations face an uphill battle regarding infrastructure and resource constraints, which can slow or hamper their ability to lean into a CE. Encouraging innovation and entrepreneurship can overcome these barriers by creating new business practices that are more resource-efficient and sustainable ([Chiappetta Jabbour et al., 2020](#)). Innovative thinkers can construct new recycling and waste management infrastructures, encourage new products from recycled materials and advocate using renewable energy sources ([Buch et al., 2021](#)). By leading a business, entrepreneurs can drive circular economic practices among consumers, governments and other stakeholders ([Elf et al., 2022](#)). Circular business ventures can establish the viability and profitability of these practices, providing a blueprint for others to emulate ([Veleva and Bodkin, 2018](#)). This creates a domino effect for the widespread adoption of sustainable economic practices.

However, before encouraging the widespread adoption of circular economic practices, we must explore entrepreneurs' motivations to start and grow their businesses. As mentioned earlier, CE requires top-down considerations. Governments should be committed to promoting such practices through supportive policies, tax incentives, subsidies, Research and Development (R&D) financing and streamlined processes to start new businesses (Guldmann and Huulgaard, 2020). In addition, market structure and financial feasibility should be considered for entrepreneurship (Govindan and Hasanagic, 2018). The feasibility assessment of resources as a rudimentary motivator for entrepreneurship in emerging nations opens up ventures for better investment decision-making. Data availability and big data are pivotal for such decisions (Khan *et al.*, 2023). These assets include natural and human resources, capital, technology and infrastructure, which provide investors with a clear vision of what to expect and how to measure their performance (Veleva and Bodkin, 2018). Entrepreneurs in these nations must leverage resources to create solutions that address waste and environmental degradation. Accordingly, natural resources such as sunshine are considered valuable assets in an all-year sunshine nation as a renewable energy solution. However, sufficient data should be available to promote such investments in developing nations (Bist *et al.*, 2020).

Marketplace and customer behaviour are pivotal factors in encouraging CE adoption in emerging nations (Dzogbenku and Keelson, 2019). The rising demand for circular economic practices, combined with the importance of sustainability, generates new business opportunities for entrepreneurs in emerging nations and an arsenal of consumers that can support the growth of these businesses (Sulaiman *et al.*, 2022). While the marketplace significantly impacts entrepreneurship investments, the business should be high yielding for investors (Łekawska-Andrinopoulou *et al.*, 2021). This refers to a form of investment in which the entrepreneur is optimistic about the return on the investment for the initial CE investment by realising its potential impacts. Many financial resources aid entrepreneurs in promoting CE adoption. Among these, investments from venture capital firms, angel investors, government agencies, or access to microfinance programs are the most prominent resources (Cezarino *et al.*, 2019). Smart funding empowers entrepreneurs to secure the resources they need to develop and grow their businesses, particularly in the early make-or-break stages of CE development (Chowdhury and Maung, 2020).

Although these factors are essential to CE entrepreneurship, the role of technology cannot be overstated. Smart incorporation of technology helps managers grow faster and reach maturity (Kayikci *et al.*, 2022). Much evidence shows the role of Industry 4.0 and customer perception in business model success. Digital technologies like blockchain or 3D printing have great potential for leveraging CE practices (Huynh, 2021). Meanwhile, evidence shows that the practical utilisation of technology leads to social engagement and collaboration which is essential for long-term sustainability, as a case study on augmented reality has shown (Katika *et al.*, 2022). Considering the environmental effects of CE, technology has been proven to leverage CE practices by managing resources and energies in the prefabricated construction business using VR, highlighting these assets' importance in promoting sustainability (O'Grady *et al.*, 2021).

To expand our understanding of the determinants that impact the emergence of social entrepreneurship in developing nations, we thoroughly examine the literature to categorise and classify as many entrepreneurial motivators as feasible into discrete groupings to augment our knowledge of social entrepreneurship motivators in developing economies. We initially sought to identify as many drivers as possible, and by collecting over 200 recent research records, we needed to group the identified drivers into a narrower classification. We conducted a systematic literature review of these findings as a conventional methodology for understanding these drivers. However, the traditional methodology is often time-consuming and inaccurate (Sabharwal and Miah, 2022). Therefore, several intelligent methodologies,

such as Latent Dirichlet allocation (LDA) topic modelling, have recently been proposed to provide more valuable insights and text summarisation (Rani and Lobiyal, 2020). Hence, Python's LangChain model (Chase, 2023) was employed to confirm our initial findings. This framework was used to develop applications powered by language models. It allows the interpretation of written manuscripts based on the Large Language Model (LLM) and then interacts with the model with the environment for smart queries. This model is beneficial because it can save time and provide precise answers based on documents provided to the database. Finally, we ran multiple tests to ensure that all the categories were combined into distinct and narrow categories. For instance, digital innovation, blockchain, or 3D printing use in a CE was identified as "Technological Advancements", for a deeper understanding of their impact on CE businesses. The decision to classify drivers into the eight distinct categories proposed in Table 1 was made to simplify the understanding of CE entrepreneurship among practitioners and experts. Practitioners and experts can better understand the critical drivers applicable to their contexts through a streamlined and focused framework. In addition to reducing bias in expert responses, this classification saves time during the questionnaire fill-out process. In addition, practitioners and experts can make informed decisions about the future of CE entrepreneurship in emerging nations using a clear and concise classification system. A solid understanding of the critical drivers allows them to make strategic decisions that align with the local market needs and promote sustainable and cyclical growth.

In addition to the findings in Table 1 and by evaluating many case studies from Small and medium-sized enterprises (SMEs) (Khan *et al.*, 2022) and start-ups (Van Opstal and Borms, 2023) on entrepreneurship opportunities and barriers in emerging nations, we already know that investment in emerging nations is benign. This is due to the low costs associated with labour, energy and manufacturing, which makes these countries a distinctive choice for entrepreneurship (Le *et al.*, 2022). In addition to the costs, the market structure is being changed in these nations and a recent study (Saura *et al.*, 2022) in hospitality validates people's tendency to preserve the environment by using green technological solutions. However, despite the opportunities arising from the market structure, innovative technologies and supportive legal and regulatory frameworks that can individually support entrepreneurs to impact developing nations significantly, there is evidence that investment in developing countries is subject to "extra-financial" risks (Kumar *et al.*, 2019). More specifically, stakeholder preferences and regulatory changes, in addition to political and technological uncertainties, are the main reasons that necessitate a deep understanding of which domain to focus on to lower the risk of entrepreneurship.

Over the past ten years, researchers have tackled various challenges and opportunities in adopting the CE business model, such as organisational collaboration (Mishra *et al.*, 2019). These studies have shown that the CE model can positively impact entrepreneurship in various industries, including fashion (de Aguiar Hugo *et al.*, 2021), agrifood (Mehmood *et al.*, 2021) and construction (Munaro and Tavares, 2023). Moreover, adopting this model can lead to innovative organisational practices (Lehmann *et al.*, 2022). Developed countries with strong economies, such as China (Li *et al.*, 2022), Nordic countries (Hildenbrand *et al.*, 2021) and EU nations (Kumar *et al.*, 2019), have shown promising results for entrepreneurship investment. However, there is a lack of systematic classification for entrepreneurial opportunities in emerging countries that emphasises the importance of the main drivers that encourage CE investments.

Therefore, gathering and evaluating these factors methodically and pinpointing critical obstacles is imperative to attain a sustainable strategic plan with greater assurance in the long run. In order to comprehensively comprehend, prioritise and categorise the execution of the drivers in developing nations, we suggest and apply the fuzzy ISM-MICMAC methodology. Fuzzy sets have been widely adopted across various fields to enhance the

ID	Driver	Correspondence to entrepreneurship in emerging countries	Recent studies
D ₁	Environment	Environmental concerns have a significant impact on entrepreneurship. The literature demonstrates that environmental degradation has a direct impact on resource availability. Such changes could raise operating and production expenses, limiting entrepreneurs' willingness to invest in developing countries. The successful implementation of the CE business model in industrialised countries has resulted in improved resource management and a higher competitive advantage over competitors	Zhu <i>et al.</i> (2019), Kasmi <i>et al.</i> (2022), Kuzma <i>et al.</i> (2021), Joensuu <i>et al.</i> (2020), Abad-Segura <i>et al.</i> (2020)
D ₂	Technological Advancements	With recent technological breakthroughs, research findings that investigate the influence of industry 4.0 technologies such as augmented reality, virtual reality, blockchain and collaborative platforms on circular economies demonstrate their beneficial impact and how they stimulate innovation in industrialised organisations. Incorporating technology is so critical in circular economies as it results in cost savings and increased efficiency	Wilson <i>et al.</i> (2021), Ilić <i>et al.</i> (2022), Manea <i>et al.</i> (2021), Chau <i>et al.</i> (2021), Kouhizadeh <i>et al.</i> (2019), Cagno <i>et al.</i> (2021)
D ₃	Legal and Regulatory	Governments have been shown to have a critical role in supporting the adoption of circular economies. They can stimulate speedier growth for enterprises that rely on sustainable practices by stipulating legislation and policies in their favour. According to several research findings, subsidies and tax exemption regulations in favour of CE enterprises stimulate increased investment in green production	Ikiz Kaya <i>et al.</i> (2021), Gedam <i>et al.</i> (2021), Zarbà <i>et al.</i> (2021), Bilal <i>et al.</i> (2020), Svensson-Hoglund <i>et al.</i> (2021)
D ₄	Supply Chain	The adoption of CE can have a significant impact on supply chain issues. Our findings show that changes in procurement, inventory management and resource allocation have been among the most researched themes in CE adoption in industrialised countries over the last few years, all of which have positively impacted company revenues	Govindan and Hasanagic (2018), Del Giudice <i>et al.</i> (2020), Nandi <i>et al.</i> (2021), Godinho Filho <i>et al.</i> (2022)
D ₅	Customer Value	While production and adequate government and external backing can result in creating green products at reduced prices, consumer perception and attitude toward these products is critical. Marketing and behavioural factors have been used in research findings to persuade consumers to purchase sustainable products	van Boerdonk <i>et al.</i> (2021), Chaudhuri <i>et al.</i> (2022), Aarikka-Stenroos <i>et al.</i> (2021), Boyer <i>et al.</i> (2021)
D ₆	Stakeholder Preference	The region in which CE entrepreneurship is implemented has a significant impact. According to research, whereas targets are set for long-term achievement in industrialised countries, this focus differs in developing countries. Furthermore, the impact of NGOs and external investors should be addressed as a key factor that varies throughout geographical locations	Palafox-Alcantar <i>et al.</i> (2020), Farooque <i>et al.</i> (2019), Salvioni and Almici (2020), Baah <i>et al.</i> (2021)

(continued)

Table 1.
Entrepreneurial
circular economy
enablers in emerging
countries

Table 1.

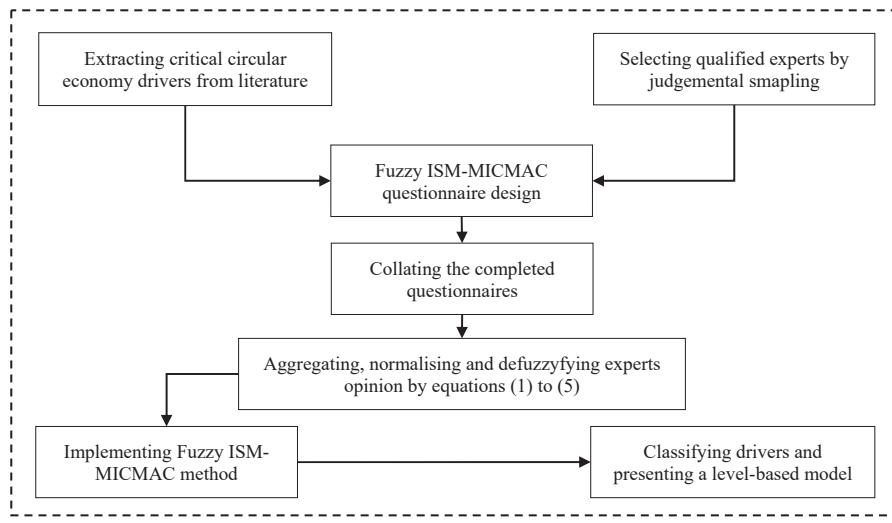
ID	Driver	Correspondence to entrepreneurship in emerging countries	Recent studies
D ₇	Leadership and Management	Using organisational behaviours and leadership styles as examples, some researchers argue that, similar to strategic planning, which should be educated throughout the organisation, adopting CE necessitates extensive knowledge for all employees. They analyse the topic from several perspectives and argue that by implementing these practices, businesses can capitalise on new opportunities while also confronting environmental challenges	Zhang <i>et al.</i> (2021), Hussain and Malik (2020), Hofmann and Jaeger-Erben (2020), Klein <i>et al.</i> (2021)
D ₈	Financial Consideration	As a critical aspect in any firm, CE entrepreneurship is based on financial considerations as well as potential resources on which investors may rely. Scholars have emphasised the function of supportive agents and solutions in assisting investors in effectively managing costs and income, resulting in business expansion through time	Rizos <i>et al.</i> (2016), Ozil (2021), Aranda-Usón <i>et al.</i> (2019), Johl and Toha (2021), Mocanu <i>et al.</i> (2022)

reliability of chronology obtained through this tool. The findings from this methodology assist entrepreneurs in developing nations to address the most pressing issues more efficiently and effectively, thereby ensuring the successful adoption of CE principles and practices.

Methodology

In tackling complex problems, ISM-MICMAC has emerged as a leading tool, offering several distinct advantages over comparable methodologies (Jafari-Sadeghi *et al.*, 2021). Research has shown that ISM-MICMAC is versatile and flexible, providing researchers with a comprehensive framework for analysing complex systems and making better decisions. For instance, the methodology was applied to improve supply chain management by identifying the key drivers of supply chains (Shanker and Barve, 2021). Using this tool, Amoozad Mahdiraji *et al.* (2021) identified critical success factors for entrepreneurship investment in emerging countries. The ISM-MICMAC method has also been implemented in various healthcare (Karamat *et al.*, 2018), human resource management (Sharma, 2021) and sustainability development case studies in emerging nations (Kumar *et al.*, 2020) over the past few years. The general research framework employed in this article is presented in Figure 1.

In this methodology, complex systems are broken down into smaller subsystems. A multilevel structural model enables individuals and groups to understand the relationships that underlie difficult situations (Iqbal *et al.*, 2022). It then uses the experts' practical expertise and knowledge to map the many elements of a given case. By using ISM-MICMAC, it is possible to understand the interaction of each system component within a broader context by breaking it down into smaller subsystems. The ISM-MICMAC methodology offers a significant benefit in that it enables the examination of both direct and indirect interrelationships between variables, thereby facilitating the analysis of the dynamic impact of various elements (Khaha *et al.*, 2020). Traditional ISM considers only binary digits to indicate whether variables are connected. Consequently, it did not capture the strength of the relationship between the variables. This problem is addressed by the Fuzzy ISM-MICMAC methodology, which involves categorising variables into four distinct categories



Source(s): Created by authors

Figure 1.
Research framework

based on their degree of influence: very weak, weak, strong and very strong (as presented in Table 2). This approach facilitates a more comprehensive comprehension of the interrelationships between variables. (Wang *et al.*, 2021). A limited amount of research, such as that of Vafadarnikjoo *et al.* (2020), has been conducted on fuzzy ISM-MICMAC in emerging countries. However, existing studies have demonstrated its potential for analysing complex systems and identifying the most critical factors in various cases.

As suggested by (Srivastava and Dashora, 2021), the following steps are involved in developing this methodology. First, brainstorming and consulting with experts are conducted to identify critical CE drivers. This research uses a systematic literature review to extract the list of critical CE drivers presented in Table 1. After, the contextual relationships between the relevant elements are evaluated. In this research, as the drivers are qualitative and subjective and limited access is available for numerical data regarding each driver, experts' opinions, intuitions and experiences have been employed to study the drivers. To identify the experts, some qualifications were considered, including the (1) education level of at least MSc, MA or MBA, (2) field of study in management, engineering or other social sciences, (3) age of at least 30 years, (4) working experience at least five years, (5) managerial experience at least three years in entrepreneurial organisations in the pharmaceutical sector of the emerging economy of Iran, (6) being a board of directors member, CEO, or senior management team. Considering these qualifications and using

Linguistic description	Triangular fuzzy number	Notation	Influence scope
No influence	(0, 0, 0.25)	NO	0
Very low influence	(0, 0.25, 0.50)	VL	1
Low influence	(0.25, 0.50, 0.75)	L	2
High influence	(0.50, 0.75, 1.0)	H	3
Very high influence	(0.75, 1.0, 1.0)	VH	4

Source(s): From Srivastava and Dashora (2021)

Table 2.
Fuzzy linguistic scale

judgemental snowball sampling, 15 experts were identified and grouped in three panels. Each panel included one academic member to explain the methodology and guide the panel members on completing the questionnaire. The expert's profile is presented in [Table 3](#).

In each meeting, first, for 30 min, the purpose of the research was explained and the academics presented how to complete the questionnaires. Then, in an average of 120 min of a panel discussion, the questionnaire was completed under each panel's academic member's supervision. The critical CE drivers are compared pairwise to create a structural self-interaction matrix (SSIM) ([Jafari-Sadeghi et al., 2021](#)). Moreover, the intensity of each of the following relations was determined by the linguistic terms mentioned in [Table 2](#).

- (1) In case element (i) leads to element (j), then (V) is used for row (i) column (j) known as a_{ij} ,
- (2) In case element (j) leads to element (i), then (A) is used for a_{ij} ,
- (3) In case element (i) leads to element (j) and vice versa, then (X) is used for a_{ij} ,
- (4) If element (i) does not lead to element (j) and vice versa, then (O) is used for a_{ij} .

Noticeably, fuzzy sets and values were used to consider the uncertainty of the environment and embed the experts' intuition and experience during the evaluation of factors. When the questionnaires were completed by experts and collated by the research team, the linguistic terms were transferred to triangular fuzzy numbers, as shown in [Table 2](#). Then, fuzzy arithmetic means measured the aggregated values for each matrix cell. Eventually, the fuzzy ISM-MICMAC matrix is transferred to a defuzzified (crisp) version by implementing the following steps: First, all cells of the fuzzy reachability matrix are normalised according to the following condition. Where $R = \max r_{ij}, L = \min l_{ij}$ and $\Delta = R - LR = \max r_{ij}$.

$$x_{mj} = \frac{m_{ij} - L}{\Delta} \quad (1)$$

Panel	ID	Gender	Area	Age (years)	Experience (years)	Managerial experience (years)	Managerial position
I	E ₁	M	I	40 _S	15 ⁺	3 ⁺	SMT
	E ₂	M	I	50 _S	25 ⁺	5 ⁺	SMT
	E ₃	F	A	40 _S	5 ⁺	—	—
	E ₄	F	A&I	60 _S	25 ⁺	25 ⁺	BoD
	E ₅	F	I	50 _S	15 ⁺	3 ⁺	CEO
II	E ₆	F	A	40 _S	5 ⁺	—	—
	E ₇	M	A&I	60 _S	35 ⁺	15 ⁺	BoD
	E ₈	M	A&I	60 _S	35 ⁺	5 ⁺	BoD
	E ₉	M	I	50 _S	25 ⁺	5 ⁺	CEO
	E ₁₀	M	I	50 _S	15 ⁺	5 ⁺	CEO
III	E ₁₁	M	A&I	50 _S	25 ⁺	5 ⁺	BoD
	E ₁₂	M	A	40 _S	5 ⁺	—	—
	E ₁₃	M	A&I	60 _S	25 ⁺	5 ⁺	BoD
	E ₁₄	M	A	40 _S	5 ⁺	—	—
	E ₁₅	M	A&I	60 _S	35 ⁺	5 ⁺	BoD

Note(s): I: Industry; A: Academia; M: Male; F: Female; BoD: Board of Directors; CEO: Chief Executive Officer,

SMT: Senior Management Team

Source(s): Created by authors

Table 3.
Experts profile

$$x_{rj} = \frac{r_{ij} - L}{\Delta} \quad (2)$$

$$x_{ij} = \frac{l_{ij} - L}{\Delta} \quad (3)$$

The normalised values for the left-hand side (LHS) and right-hand side (RHS) were then measured according to the following equations:

$$lhs = \frac{x_{mj}}{1 + x_{mj} - x_{rj}} \quad (4)$$

$$rhs = \frac{x_{rj}}{1 + x_{rj} - x_{mj}} \quad (5)$$

The total normalised crisp value was measured according to $x_j^{crisp} = [lhs(1 - rhs) + lhs * rhs] / [1 - lhs + rhs]$. Finally, the defuzzified/crisp value for each cell of the matrix was calculated via $f_{ij} = L + (x_j^{crisp} * \Delta)$ (Srivastava and Dashora, 2021). Subsequently, the SSIM produces a reachability matrix when (V) and (X) are replaced with (1) and (A) and when (O) is replaced with (0) (Jafari-Sadeghi *et al.*, 2021). Next, transitivity was evaluated. A transitive relationship implies that if A is related to B and B is related to C, then A is related to C. All (0) values were transferred to (1*) when this rule was applied (Jafari-Sadeghi *et al.*, 2021). The next step converts the reachability matrix into a canonical matrix by arranging elements according to their levels. Here, the two indicators known as the driver and dependent power are measured

by DR (i) = $a_{i.} = \sum_{j=1}^n a_{ij}$ and DE (j) = $a_{.j} = \sum_{i=1}^m a_{ij}$, respectively (Amoozad Mahdiraji *et al.*, 2021).

The next stage creates a directed graph based on relationships within the reachability matrix. An ISM is created by removing transitive links and replacing enablers with statement nodes by considering the following rules (Jafari-Sadeghi *et al.*, 2021).

- (1) Define the reachability (output) set for element (i), which encompasses the list of elements affected by element (i) (i.e. elements that have value (1) in the ith row).
- (2) Define the antecedent (input) set for element (i), which embraces the list of factors that have an impact on element (i) (i.e. elements that have value (1) in the jth column).
- (3) Define the intersection (common) set for element (i), which is reachable and antecedent.
- (4) If the intersection and antecedent sets are the same for a specific element, it is selected as a high-level element and eliminated from Final Reachability Matrix (FRM).

The above steps are repeated until all the elements are levelled. According to the MICMAC, variables can be classified into four categories: (1) autonomous variables, (2) dependent variables, (3) linkage variables and (4) independent variables. Variables with autonomy have low driving power and low dependence, meaning that they are influenced by other variables but have little influence on them. Dependent variables have a high degree of dependence but low driving power, meaning that they are heavily influenced by other variables but have little effect on them. A high degree of dependence and driving power indicate that the linkage variables are strongly influenced by and strongly influenced by other variables. An independent variable has high driving power but low dependence, meaning that it is significantly influenced by other variables but not significantly influenced by them (Gorane and Kant, 2013).

Findings

As previously discussed, the initial findings reflect the viewpoint of the expert panel. An online session was conducted during this investigation. In this session, a cohort of Iranian academic and industry professionals is briefed on the drivers of CE entrepreneurship in emerging countries. Subsequently, they were asked to respond to the questionnaires based on Fuzzy logic. Given academics' close relationship with the industrial sector in today's business landscape, combining academics with industry professionals was deliberate. At least three active members from the academic and industrial sectors were involved in each panel. All were over 30 years old, had more than five years of managerial experience in entrepreneurial organisations and had at least a bachelor's degree in engineering or management. These experts participated in three hours meetings. First, an academic described the research objectives and how to complete the questionnaires in 30 min. Subsequently, in each panel, experts discussed and completed the ISM-MICMAC questionnaires using linguistic terms, as presented in Table 2. Table 4 shows the arithmetic mean of their fuzzy opinions that were aggregated.

Next, based on the normalisation and defuzzification equations suggested by (Srivastava and Dashora, 2021), the table was transformed to the crisp values, shown in Table 5.

The interactive matrix is then transformed to a zero and one matrix, as shown in Table 6, to construct the reachability matrix for further calculations. The transitivity test is performed at this stage and the final reachability matrix is constructed using the previously mentioned rules. Furthermore, the driver-dependent power map is calculated and displayed based on a study by (Jafari-Sadeghi *et al.*, 2021). It should be noted that the dependent power DR(j) refers to the power map of the eight factors, whereas the driver's power DR(i) shows the driver power of each factor.

	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D ₈
D ₁	(0, 0, 0.25)	(0.5, 0.75, 0.917)	(0.583, 0.833, 0.917)	(0.583, 0.833, 1)	(0.417, 0.667, 0.833)	(0.333, 0.5, 0.75)	(0, 0.083, 0.333)	(0.583, 0.833, 1)
D ₂	(0.417, 0.667, 0.917)	(0, 0, 0.25)	(0.083, 0.25, 0.5)	(0.333, 0.583, 0.833)	(0.333, 0.583, 0.75)	(0, 0.167, 0.417)	(0.417, 0.667, 0.833)	(0.417, 0.667, 0.917)
D ₃	(0.5, 0.75, 0.917)	(0.25, 0.5, 0.75)	(0, 0, 0.25)	(0.167, 0.25, 0.5)	(0.167, 0.25, 0.5)	(0, 0.167, 0.417)	(0.417, 0.667, 0.833)	(0.5, 0.667, 0.917, 1)
D ₄	(0.417, 0.667, 0.917)	(0.333, 0.583, 0.833)	(0.167, 0.417, 0.667)	(0, 0, 0.25)	(0.417, 0.667, 0.917)	(0.167, 0.333, 0.583)	(0, 0.167, 0.417)	(0.333, 0.583, 0.833)
D ₅	(0.417, 0.667, 0.833)	(0.25, 0.5, 0.75)	(0.25, 0.5, 0.75)	(0.167, 0.333, 0.583)	(0, 0, 0.25)	(0.75, 1, 1)	(0.417, 0.667, 0.833)	(0.5, 0.75, 0.833)
D ₆	(0.25, 0.5, 0.75)	(0.25, 0.5, 0.75)	(0.25, 0.5, 0.75)	(0.167, 0.417, 0.667)	(0.5, 0.75, 1)	(0, 0, 0.25)	(0.5, 0.75, 0.917)	(0.417, 0.667, 0.833)
D ₇	(0.083, 0.333, 0.583)	(0.25, 0.417, 0.667)	(0.417, 0.667, 0.833)	(0.167, 0.417, 0.667)	(0.333, 0.583, 0.833)	(0.417, 0.667, 0.917)	(0, 0, 0.25)	(0.417, 0.667, 0.917)
D ₈	(0.417, 0.667, 0.833)	(0.417, 0.667, 0.833)	(0.417, 0.667, 0.917)	(0.25, 0.5, 0.75)	(0.333, 0.583, 0.833)	(0.417, 0.667, 0.917)	(0.333, 0.583, 0.833)	(0, 0, 0.25)

Table 4.
Fuzzy aggregated ISM
matrix

Source(s): Created by authors

The MATLAB code calculates the reachability and antecedents of all factors and their intersections at this point. [Table 7](#) depicts the procedure for determining the level-based conceptual model, which assigns the first level to factors whose reachability set values equal the intersections. Therefore, D₆ and D₈ are selected as the first level in this case. In round two, after removing rows D₆ and D₈, the loop is repeated to calculate level two. Technological advancements (D₂) and legal and regulatory factors (D₃) were selected for level two and removed from the matrix. In the third round, D₅ and D₇ were selected by repeating this method. Consequently, D₁ and D₄ were allocated to level 4.

Finally, a stage-based conceptual model is designed, as shown in [Figure 2](#). This model was designed based on factor levels and showed a within-level relationship between the factors.

A comprehensive map was developed based on the relationships between interdependence and influence of various factors. This map identifies distinct areas that drive CE entrepreneurship in emerging countries. The map divides these factors into four categories, as shown in [Figure 3](#). Stakeholder preferences are highly dependent, but have little driving power. On the other hand, the independent variables - technological advancement, supply chain, leadership and management - have high driving power but low dependence, indicating that they can influence other variables without being influenced.

In developing countries, such as Iran, stakeholder preferences significantly influence CE adoption ([Jokar et al., 2021](#)). The government, non-governmental organisations and business leaders can encourage eco-friendly business models by enacting policies and providing incentives to encourage sustainable practices. The varying stakeholder preferences of emerging countries make understanding their context and dynamics essential for developing effective CE strategies.

	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D ₈
D ₁	0.083	0.722	0.778	0.806	0.639	0.528	0.139	0.806
D ₂	0.667	0.083	0.278	0.583	0.556	0.194	0.639	0.667
D ₃	0.722	0.500	0.083	0.306	0.194	0.639	0.639	0.861
D ₄	0.667	0.583	0.417	0.083	0.667	0.361	0.194	0.583
D ₅	0.639	0.500	0.500	0.361	0.083	0.917	0.639	0.694
D ₆	0.500	0.500	0.500	0.417	0.750	0.083	0.722	0.639
D ₇	0.333	0.444	0.639	0.417	0.583	0.667	0.083	0.667
D ₈	0.639	0.639	0.667	0.500	0.583	0.667	0.583	0.083

Source(s): Created by authors

Table 5.
De-Fuzzy (crisp)
aggregated ISM matrix

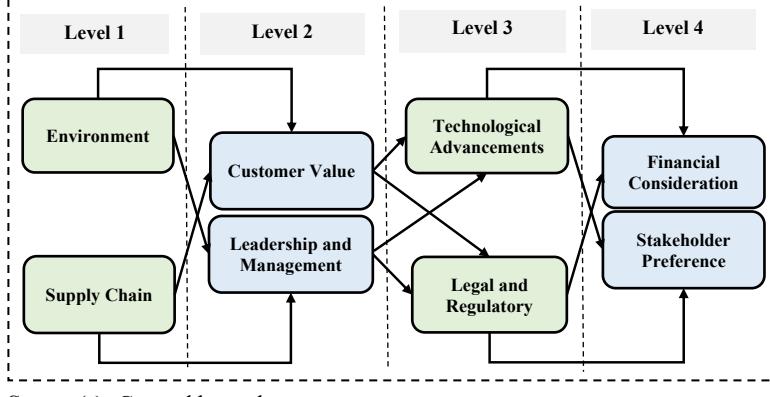
	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D ₈	Driving power
D ₁	1*	1	1	1	1*	1*	0	1	7
D ₂	1	1*	1*	1*	0	1*	0	1	6
D ₃	1	1*	1*	1*	0	1*	0	1	6
D ₄	1	1*	1*	1*	1	1*	0	1*	7
D ₅	0	0	1*	0	1*	1	1*	1	5
D ₆	0	0	0	0	1	1*	1	1*	4
D ₇	0	0	1*	0	1*	1	1*	1	5
D ₈	1*	0	1	0	1*	1	1*	1*	6
Dependence power	5	4	7	4	6	8	4	8	

Source(s): Created by authors

Table 6.
Final reachability
matrix and DDPM

Table 7.
Level-based factor
determination for ISM

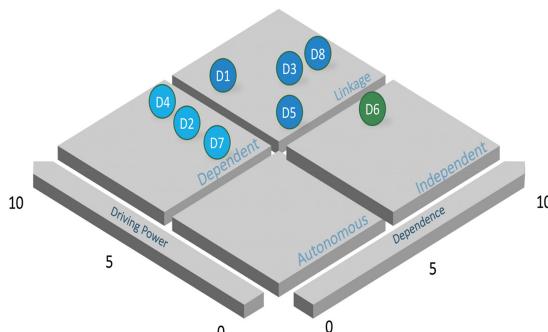
Criteria	Reachability set	Antecedent set	Intersection set	Level
<i>Round 1</i>				
D ₁	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₆ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₈	
D ₂	D ₁ -D ₂ -D ₃ -D ₄ -D ₆ -D ₈	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	
D ₃	D ₁ -D ₂ -D ₃ -D ₄ -D ₆ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₇ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₈	
D ₄	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₆ -D ₈	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	
D ₅	D ₃ -D ₅ -D ₆ -D ₇ -D ₈	D ₁ -D ₄ -D ₅ -D ₆ -D ₇ -D ₈	D ₅ -D ₆ -D ₇ -D ₈	
D ₆	D ₅ -D ₆ -D ₇ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₆ -D ₇ -D ₈	D ₅ -D ₆ -D ₇ -D ₈	1
D ₇	D ₃ -D ₅ -D ₆ -D ₇ -D ₈	D ₅ -D ₆ -D ₇ -D ₈	D ₅ -D ₆ -D ₇ -D ₈	1
D ₈	D ₁ -D ₃ -D ₅ -D ₆ -D ₇ -D ₈	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₆ -D ₇ -D ₈	D ₁ -D ₃ -D ₅ -D ₆ -D ₇ -D ₈	1
<i>Round 2</i>				
D ₁	D ₁ -D ₂ -D ₃ -D ₄ -D ₅	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	
D ₂	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	2
D ₃	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄ -D ₅ -D ₇	D ₁ -D ₂ -D ₃ -D ₄	2
D ₄	D ₁ -D ₂ -D ₃ -D ₄ -D ₅	D ₁ -D ₂ -D ₃ -D ₄	D ₁ -D ₂ -D ₃ -D ₄	
D ₅	D ₃ -D ₅ -D ₇	D ₁ -D ₄ -D ₅ -D ₇	D ₅ -D ₇	
D ₇	D ₃ -D ₅ -D ₇	D ₅ -D ₇	D ₅ -D ₇	
<i>Round 3</i>				
D ₁	D ₁ -D ₄ -D ₅	D ₁ -D ₄	D ₁ -D ₄	
D ₄	D ₁ -D ₄ -D ₅	D ₁ -D ₄	D ₁ -D ₄	
D ₅	D ₅ -D ₇	D ₁ -D ₄ -D ₅ -D ₇	D ₅ -D ₇	3
D ₇	D ₅ -D ₇	D ₅ -D ₇	D ₅ -D ₇	3
<i>Round 4</i>				
D ₁	D ₁ -D ₄	D ₁ -D ₄	D ₁ -D ₄	4
D ₄	D ₁ -D ₄	D ₁ -D ₄	D ₁ -D ₄	4



Source(s): Created by authors

Figure 2.
CE entrepreneurial
factors relation based
on ISM level-
based model

The adoption and success of circular business models in developing countries are influenced by technological advancements, supply chains, leadership and management. Supply chain entrepreneurship is one of the primary drivers of a CE. As part of the ISM MICMAC methodology, we identified significant linkage variables, including the environment, legal and regulatory frameworks, customer values and financial factors. A high degree of



Source(s): Created by authors

Figure 3.
MICMAC classification
results

dependence and driving power indicate that these variables can influence and be influenced by other variables.

Circular economic practices are influenced by environmental factors such as climate change and resource depletion in developing countries. By reducing the ecological impact of industrial activities, business models can help businesses meet their sustainability commitments (Hysa *et al.*, 2020). Legal and regulatory frameworks can also influence firms' adoption of sustainable practices. It can drive circular business models by creating a demand for sustainable and responsible practices. Financial incentives can also be significant for encouraging businesses to adopt sustainable practices. In business models, companies can save money and increase profits by focussing on resource efficiency and waste reduction.

Discussion and implications

Theoretical implications

This research has broad implications for entrepreneurial and management literature. Although the transition to sustainable production is gaining a major interest across disciplines, existing literature still mostly focuses on developed nations, such as EU countries (e.g. Pirvu *et al.*, 2019). Thus, this study broadens the existing literature on circular business model transitions (for example, Veleva and Bodkin, 2018; Hina *et al.*, 2022; Wrålsen *et al.*, 2021) by adding the perceptions of entrepreneurs in developing countries. The results also show that the drivers of entrepreneurs in developing countries pursuing circular business models differ from those of developed ones. In particular, for developing countries, environmental and supply chain drivers appeared to have the highest importance, whereas, for developed countries, the importance of legislative policies and financial factors was underlined (Wrålsen *et al.*, 2021). Stakeholder pressure, on the other hand, appears to be less relevant for developing countries than for developed countries (Hina *et al.*, 2022).

Additionally, the theoretical foundations were extended by interactions between specific drivers. Thus, although the literature often puts management skills close to internal technological development (Suchek *et al.*, 2021), linkages of lower strength but higher driving power were found in this research.

This research also contributes to the methodology by showing an additional use case for the Fuzzy-ISM MICMAC technique. Scholars and policymakers can improve resource utilisation and build efficient CE policies by incorporating linear optimisation approaches into future investigations that consider emerging countries' unique contextual characteristics. Using the fuzzy ISM-MICMAC, this study discovered and effectively classified the primary determinants encouraging entrepreneurship in developing nations. Scholars are encouraged to delve deeper

into this issue using more advanced approaches. Combine the ISM MICMAC with Interval-Valued Intuitionistic Fuzzy (IVIF), hesitant fuzzy numbers, or Fermatean number sets for even more dependable results. Furthermore, future research could apply this problem in conjunction with structural equation modelling (SEM) or the principal component analysis (PCA) technique to investigate additional elements of CE in developing nations.

2728

Practical implications

This study emphasises the importance of financial considerations for supporting circular entrepreneurship in emerging countries. However, initial investment costs may prevent some businesses from adopting circular business models, which can result in long-term savings and increased profitability. Circular entrepreneurship requires further research into its financial implications to overcome initial investment costs. In addition, this research shows the importance of top management skills and technology availability, which lie at the bottom of the circular business model transition. Thus, before the transition occurs, managers need to invest in research and development to reach a high level of technology development, as well as develop leadership and management skills.

Various factors contribute to the dynamics of a CE in developing nations. These factors include sanctions, low labour costs and energy prices, which are relatively lower than those in EU countries. Understanding these limitations and possibilities will facilitate policymaking in developing countries. This yields a more nuanced understanding of the complexities of implementing circular economic practices in emerging economies. Considering the importance of reaching the Sustainable Development Goals (SDGs) underlined by the United Nations and the appearance of regional strategies based on circular economies ([Haleem et al., 2020](#)), it is especially important for policymakers worldwide to promote SDGs in developing countries. This study shows that cohesive legislation and subsidies for entrepreneurs may be an important driver for them to switch to circular business models. Moreover, these factors appear to be highly connected with other drivers, putting them at the centre of the framework.

Conclusion

The transition to a CE is becoming an increasingly important topic across multiple disciplines. Despite this, more research is needed to focus on developing countries' perspectives on the shift to circular business models. This study contributes new insights into the perceptions of entrepreneurs in developing countries and extends the existing literature on business models. Our research reveals that the drivers of circular business models differ between industrialised and developing countries. Environmental and supply chain factors are more significant for developing countries, while industrialised countries prioritise legislative and financial policies. Our study also highlights the importance of stakeholder engagement, which is less prevalent in developing countries than in industrialised ones.

Furthermore, by utilising Fuzzy ISM-MICMAC, our research contributes to the theoretical basis for transitioning to a circular business model by identifying specific drivers and their interactions. This study demonstrates that management skills and internal technological development have high driving power, even though they have lower strength. These findings provide insights for policymakers and business leaders seeking to promote sustainable practices and circular business models in developing countries.

Limitations and avenues for further research

As with any empirical study, the research under consideration has some limitations. Scholars are advised to promote CE practices in emerging countries using a multi-stakeholder approach,

as suggested by [Pereno and Eriksson \(2020\)](#), to gain a more comprehensive understanding of the role of such a driver in adopting circular economies in emerging countries, since stakeholder scope was limited in this study. Many stakeholders, including government bodies, non-governmental organisations, business leaders, investors and consumers, must be involved in fostering circular entrepreneurship. Therefore, additional research is required to understand their perspectives and motivations better. This study suggests that emerging countries should encourage circular entrepreneurship through context-specific measures. The CE identified in this study may have varying degrees of relevance and significance across different countries and regions. For instance, nations with abundant natural resources and proximity to supply chain partners may benefit from supply chain drivers. However, countries with advanced technological development may have a more profound impact. Thus, there is a need to conduct research in various regions and countries to promote circular entrepreneurship.

This study emphasises the importance of financial considerations for supporting circular entrepreneurship in emerging countries. However, initial investment costs may prevent some businesses from adopting circular business models, which can result in long-term savings and increased profitability. CE entrepreneurship requires further research into its financial implications to overcome initial investment costs. Various factors contribute to the dynamics of a CE in developing nations. These factors include sanctions, low labour costs and energy prices, which are relatively lower than those in EU countries. Understanding these limitations and possibilities will facilitate the exploration of new research avenues. This yields a more nuanced understanding of the complexities of implementing circular economic practices in emerging economies.

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Corresponding author

Hannan Amoozad Mahdiraji can be contacted at: h.m.amoozad@bham.ac.uk

Expression of concern: The publisher of Management Decision is issuing an Expression of Concern for the following article Beheshti, M., Amoozad Mahdiraji, H. and Rocha-Lona, L. (2023), "Transitioning drivers from linear to circular economic models: evidence of entrepreneurship in emerging nations", *Management Decision*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/MD-02-2023-0279>, which was submitted to the guest-edited special issue 'Navigating the role of circular economy in entrepreneurship: Opportunities and challenges'. An investigation by the publisher found a number of articles with multiple concerns, including but not limited to compromised editorial handling and reviewing, undisclosed conflicts of interest, and lack of suitability for the scope of the journal. As a result of these concerns and as trust in the content is central to the integrity of the publication process, the Editor-in-Chief and publisher have taken the decision to publish an Expression of Concern for all articles within this special issue. The journal has not been able to confirm whether the authors were aware of these concerns. The authors of this article would like to note that they do not agree with the content of this notice. An investigation is ongoing and is currently unresolved. Further information will be provided by Management Decision as it becomes available.

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