Eliciting Circular Economy Performance Via Zero Waste Practices, Supply Chain Collaboration, and Circular Economy Entrepreneurship: A Network Theory Perspective.

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ABSTRACT

Discovering ways to achieve greater circular economy (CE) performance from the lenses of small and medium-sized (SMEs) has been of crucial interest to scholars and policymakers due to its ability to curb the limitations of the linear economy and preserve natural resources. Extant literature insinuates that SMEs due to their many constraints form supply chain collaborations (SCC) to amass resources in their effort to promote CE performance. However, a research gap exists regarding how SMEs' efforts to adopt zero waste practices (ZWP) drive the formation of circular-oriented SCC which in turn initiates the development of circular economy entrepreneurship (CEE) for enhanced CE performance. Thus, this study draws on the network theory to explore the framework through which the adoption of ZWP impacts SCC, CEE, and CE performance. Based on quantitative analysis of responses from 152 managers of SMEs in Nepal, the results reveal that ZWP positively and significantly drives SCC and CE performance. Interestingly, the findings discover that SMEs in SCC significantly develop CEE which also robustly advance CE performance. The serial indirect effects reveal that SCC and CEE have mediating influences in the relationship between ZWP and CE performance.

This study extends the ZWP discussion to the CE domain, thereby identifying ZWP as a potent means for managers to drive SCC, CEE and CE performance. This study presents future research directions as well as guidance for managers, policymakers, and scholars.

Keywords: Circular economy entrepreneurship, Zero waste practices, Supply chain, Network theory, Small and medium enterprises, Developing economy.

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1. INTRODUCTION

Waste generation is considered a global environmental issue leading to environmental degradation, depletion of natural resources, pollution and greenhouse gas emissions, particularly in developing countries (Agyabeng-Mensah et al., 2021; Aryal & Adhikary, 2024; Guerrero et al., 2013). For example, in Nepal, waste generation is increasing rapidly due to the increase in population and urbanization contributing to excessive use of natural resources, energy and water (Pokhrel & Viraraghavan, 2005). Although manufacturing firms have smaller contributions to the total waste than households, the waste is hazardous, poorly, and unsafely managed due to a lack of resources and technical expertise (Pokhrel & Viraraghavan, 2005; Subedi et al., 2023). To combat such environmental issues, scholars (Heikkinen et al., 2023; MacArthur, 2013) emphasise the role of circular economy (CE) as a driver in reducing waste generation by reusing and recycling, further contributing to decreased environmental degradation and dependencies on virgin raw materials. In line with this, CE studies (Afum et al., 2022; Agyabeng-Mensah et al., 2021; Phillips et al., 2011; Song et al., 2015) have suggested zero waste practices (ZWP) as a CE strategy that can address global waste and environmental concerns.

Zero waste is 'a philosophy that encourages the redesign of resource's life cycle so that all products are recycled' and 'no trash is sent to landfills and incinerators' (Song et al., 2015, p. 199). Furthermore, the authors state that at the firm level, by adopting the 3R principles of reduce, reuse and recycle, ZWP ensures efficient utilisation of materials, energy and water that eliminates waste generation in the production and consumption cycle. However, Agyabeng-Mensah et al. (2022) note that firms require holistic changes in the current extraction of resources, production, consumption and waste treatment systems to achieve zero waste. Adding to this, the authors posit that to achieve effective ZWP, firms require resources and technological expertise which SMEs tend to lack.

To address such resource constraints, scholars (Rijal et al., 2024; Sudusinghe & Seuring, 2022) suggest SMEs initiate supply chain collaboration (SCC) to acquire resources and technical and entrepreneurial capabilities. SCC creates an environment for sharing resources and knowledge with SMEs and other supply chain partners, which stimulates the knowledge spillover effect which in turn drives innovation and capability (Mishra et al., 2021). Curran and Williams (2012) add that working towards zero waste requires a network approach to inspire the stakeholders to a common vision such as adopting waste-related policies and technologies as well as developing newer approaches to improve the existing system. Adding to this, Baah et al. (2023), drawing from network theory, elucidate that through alliance and collaboration with supply chain partners, SMEs can develop circular economy entrepreneurship (CEE) to effectively engage with ZWP and meet their CE performance. Thus, CEE is a crucial resource that enables SMEs to identify CE opportunities by scanning their environment and exploiting such opportunities to achieve CE performance (Baah et al., 2023; del Mar Alonso-Almeida et al., 2021).

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While CE is gaining momentum in emerging economies (Agyabeng-Mensah et al., 2024), only a few studies (Baah et al., 2023; Cataldo et al., 2024; Rijal et al., 2024) have focused on Nepal. In addition, these studies have largely ignored the effect of ZWP on CE performance. Hence, studies that explore how SMEs engage in ZWP contribute to CE performance are lacking. According to Kumar (2017), SMEs form about 67% of the Nepal manufacturing sector and as such, prioritising and supporting SMEs to achieve CE performance can stimulate sustainable development. From the discourse, this study argues that manufacturing SMEs in Nepal by implementing ZWP, will initiate the formation of circular-oriented SCC which in turn drives CEE for CE performance as depicted in Figure 1. Primarily, this study contributes to the CE literature by examining the associations between ZWP, SCC, CEE and CE performance in the novel context of Nepal. This study draws on the network theory to address the following research objectives:

i) To investigate the relationship between ZWP, SCC, CEE and CE performance.
ii) To examine the serial mediating role of SCC and CEE on the ZWP-CE performance relationship.

The rest of the paper is divided into five sections. Section 2 provides the theoretical background and research hypothesis, followed by Section 3 which describes the research approach of this study. Section 4 presents the results and Section 5 provides a discussion of the results including theoretical and practical implications. Lastly, Section 6 highlights the conclusion, limitations and future research.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESIS

2.1 Network Theory

From the business perspective, network theory emphasises the interdependent nature of network actors such as firms, employees and suppliers and their relationships in determining resource flow within the network relationship (Wasserman & Faust, 1994). Liao (2022) asserts that firms are embedded in networks which are defined as a set of actors and linkages between actors who facilitate establishing connections to access resources and opportunities, potentially influencing each other's performance. Adding to this, firms can leverage their network collaboration in mobilising resources such as gaining information, funding, and access to technology and natural resources (Huggins & Thompson, 2015). Moreover, SMEs facing resource constraints can benefit from network collaboration to amass critical resources that would otherwise be difficult to access, which are essential for creating and sustaining innovativeness and competitiveness (Huggins & Thompson, 2015). Studies (Aldrich & Zimmer, 1986; Granovetter, 1973) highlight that firms' access to diverse resources through network collaboration depends on their network ties. Despite its potential, network theory faces some criticisms in its ability to ascertain which network actors are more important than the others for resource acquisition. Thus, businesses are advised to engage with stronger network ties such as family and friends who provide assistance and share critical resources and interact with the weaker ties such as other entrepreneurs and competitors to acquire new knowledge and resources (Brüderl & Preisendörfer, 1998; Granovetter, 1973).

Curran and Williams (2012) in the European context posit that ZWP implementation is complex and thus necessitates networking with industry partners and the integration of innovative technologies to achieve CE performance. Adding to this, Huang et al. (2020) highlight that close network collaboration with supply chain partners facilitates risk sharing, reduces transaction costs and improves productivity while increasing profitability. Moreover, SCC contributes to the creation of circular products or raw materials that are durable, recyclable, reusable or repairable, which further extends the product or resource life-cycle and creates a close loop of resources (Groenewald, 2024). In CE literature, studies (Baah et al., 2023; Ghinoi et al., 2020) highlight the relevance of collaboration to CE entrepreneurs in their quest to generate and implement innovative concepts. Because ZWP emphasise on elimination of waste rather than management, the whole process of elimination requires entrepreneurs to generate new ideas and methods. Audretsch and Fiedler (2023) indicate that while creating knowledge and resource spill over effect through collaboration with supply chain partners, by deploying CEE, entrepreneurs can utilise untapped resources of another firm as an opportunity that stimulates innovation, creativity and competitiveness contributing to CE performance.

From the discourse, we argue that the network theory drives SCC for the development of CEE and helps to understand the SCC-CEE relationship that aids in CE performance by ZWP. This study further argues that adopting ZWP via the mediating influences of SCC and CEE enhances CE performance.

2.2 The Effect of ZWP on SCC

Scholars (Nassani et al., 2023; Young et al., 2010) assert that firms driven by ZWP have to pay attention to their supply chain partners and extend their collaboration with them to amass resources, as well as access to knowledge and technology. In addition, the increased stakeholder pressure is also prompting firms to optimize SCC to gradually replace traditional knowledge, production techniques, technology and resources with circularity-oriented approaches to achieve zero waste targets (Nassani et al., 2023). Genovese et al. (2017) posit that supply chain actors with CE emphasis can offer firms infinite opportunities to recycle, reuse, reduce, and remanufacture materials and resources that extend the lifespan of products and materials, removing waste generation and reducing dependencies on energy and natural resources. According to Chavez et al. (2023), CE initiatives such as ZWP is radical, thus, it requires strong collaboration with supply chain partners for continuous resource restoration. Thus, this study argues that:

H1: ZWP has a positive effect on SCC.

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2.3 The Effect of ZWP on CE performance

With the vision of eliminating waste in production and consumption, ZWP promotes product redesign, reuse and repair, and fosters waste recycling and recovery for enhanced resource conservation (Mungai et al., 2020; Tseng et al., 2022). From the organizational learning and lean management perspectives, Agyabeng-Mensah et al. (2021), in their study among manufacturing SMEs in Ghana, found that ZWP reduces greenhouse gas emissions and environmental pollution and encourages product stewardship and sustainable development and, resultantly, serves as a source for improved CE performance. Their finding suggests that zero waste practices positively impact CE performance. In addition to reducing negative environmental impacts, ZWP reduces waste generation helping firms achieve a competitive advantage and save raw materials costs as well as boost profitability (Jabbour et al., 2020). In line with Agyabeng-Mensah et al. (2021), this study argues that ZWP drives CE performance. Thus, this study proposes that:

H2: ZWP has a positive effect on CE performance.

2.4 The Effect of SCC on CE performance

Bai et al. (2020) suggest that supply chain partners influence CE performance in conducting business. According to Ramanathan and Gunasekaran (2014), SCC offer several benefits to a firm by saving cost, timely product supply, support with future sales planning and improving their environmental impact in the manufacturing process. Adding to this, SCC enables SMEs to cooperate with supply chain partners to develop and implement CE practices in achieving CE performance through risk and resource sharing (Yuan & Pan, 2023). Studies (Agyabeng-Mensah et al., 2022; Baah et al., 2023) underscore the significance of such collaboration to SMEs in acquiring initial capital investments to design and implement CE processes, which might be challenging to achieve on their own given the resource constraints. In this sense, a partnership between SMEs and SCC partners can foster synergies for a continuous joint effort that enhances the efficiency of resource use through new product design adopting the circularity concept (Le et al., 2024). Moreover, by co-developing CE processes and guidelines, such joint efforts result in achieving enhanced CE performance. In line with Rijal et al. (2024), this study argues that by improving CE information sharing and providing a platform for resource sharing, SCC facilitates achieving CE performance. Thus, this study proposes that:

H3: SCC has a positive effect on CE performance.

2.5 The Effect of SCC on CEE

While most studies (Le et al., 2024; Rijal et al., 2024) examine the impact of CEE on SCC, this study argues that collaboration with supply chain partners drives CEE. Achieving CE requires a systemic approach which involves stakeholders such as suppliers (Heikkinen et al., 2023). This is because suppliers are responsible for the sourcing and movement of raw materials globally and own the critical resources essential for CE entrepreneurs (Chavez et

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al., 2023), thus, are an important part of a firm's value chain. Through SCC, CE entrepreneurs gain access to these resources and learn about CE practices such as recycling, reducing, and remanufacturing and gain CE expertise that develops their CEE capability, which helps to identify CE-related opportunities. Adding to this, new knowledge about CE practices stimulates the creation of innovative ideas, which in turn leads to the exploitation of CE opportunities through the production of sustainable goods and services (Mardani et al., 2018). Moreover, by optimizing SCC, SMEs can benefit from each other's strengths to cope with risk and uncertainties (Le et al., 2023). Thus, this study argues that:

H4: SCC has a positive effect on CEE.

2.6 The Effect of CEE on CE Performance

Given the value-creating role of entrepreneurs, scholars (Cullen & De Angelis, 2021; Suchek et al., 2022) indicate that CEE improves the efficiency and effectiveness of resource use through circularity and facilitates achieving CE performance. Additionally, Baah et al. (2023) contend that via CEE, SMEs can acquire and grow capabilities into core competencies and take advantage of CE opportunities arising in the business environment. CEE, in addition to providing means to CE-related knowledge and technical expertise, enables SMEs to scan their environment to identify and seize CE opportunities (Le et al., 2024). Based on the discourse, this study argues that CEE helps to develop knowledge and technical capabilities to enhance CE performance. Thus, this study hypothesises that:

H5: CEE has a positive effect on CE performance.

2.7 The Effect of ZWP on CE Performance Via SCC and CEE

ZWP emphasises the necessity of product design, packing and manufacturing that recovers value from the end-of-life product and fosters circularity of resources (Farooque et al., 2019). Achieving ZWP requires a collaborative approach with supply chain partners for eliminating waste and sharing resources, risks and benefits and developing expertise and capabilities (Farooque et al., 2019; Luthra et al., 2022). These collaborative conditions enable CEE that drive systemic change. By utilising resources, new methods and technologies, CE entrepreneurs develop innovative solutions in the form of sustainable products, services, processes, and ideas that promote CE performance. While zero-waste practices are gaining traction in the CE domain from the business and academic perspective (Agyabeng-Mensah et al., 2021; Nassani et al., 2023), studies examining how ZWP impact CE performance via SCC and CEE in emerging economies are very limited. Based on the discourse, this study argues that SMEs tend to implement zero-waste practices that drive collaboration with supply chain partners for amassing CE-related knowledge, resources and technologies which develop CEE to explore and exploit CE opportunities resulting in improved CE performance. Thus, this study hypothesises that:

H6: SCC and CEE mediate the relationship between ZWP and CE performance.

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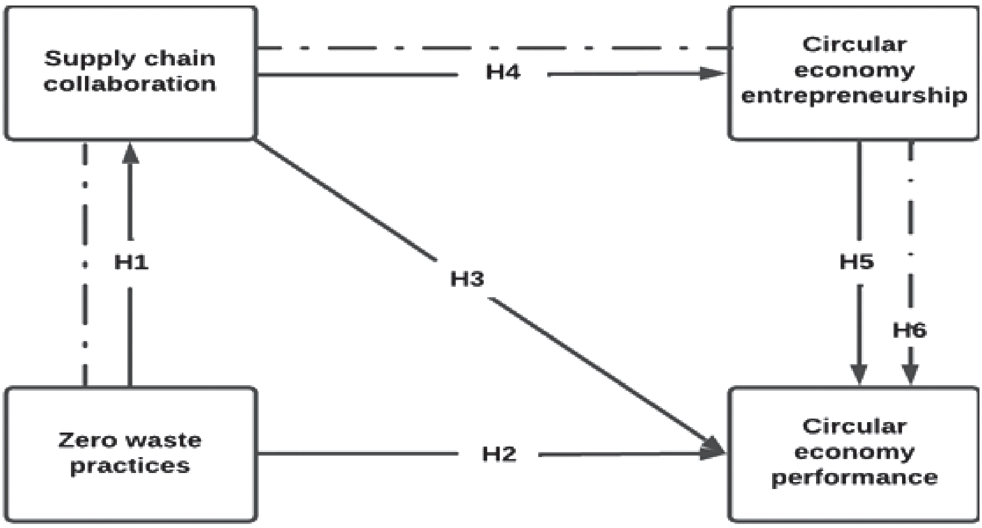
Figure1

Research model (created by Author)



3. RESEARCH APPROACH

3.1 Data Collection and Sample Size

This study focuses on Nepal as a research context. Although Nepal has integrated sustainable development goals into its national development frameworks (United Nations, 2020), the policies contributing to SDGs are still in the early stages and mainly focus on solid waste management. For example, according to Aryal and Adhikary (2024), the "Solid Waste Management Act, 2011" and the "Solid Waste Management Rules, 2013" serve as the governing regulations for household, private and government organisations. These regulations provide guidelines for waste management that promote recycling, reusing and reducing solid waste at the source and disposing of waste safely in a sustainable manner. Despite its commitment to the United Nations Global Waste Management Goals, Nepal continuously face challenges such as lack of government support, corruption, and resource and technological constraints that impede its target of sustainable waste management (Aryal & Adhikary, 2024; Baah et al., 2023).

Using a quantitative approach and simple random technique, this study collected survey data from 152 SME managers. The SMEs who met the following criteria were contacted via the Federation of Nepalese Chambers of Commerce and Industry (FNCCI) online platform: (1) they must be manufacturing firms; (2) they should have implemented CE practices, and (3) they should have complete contact information available on the platform. For pretesting, the developed questionnaire was distributed to three academics and business professionals who recommended some minor changes to the length, word choices, and sentence phrasing.

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Although about 600 managers working in different firms were contacted, only 340 managers agreed to participate in the survey. This study used a multi-source data collection method, hand-distributed some questionnaires and also distributed some on internet platforms such as LinkedIn and emails. Out of 340 responses, only 152 responses were complete and useable indicating a response rate of 44.7%. Using G*Power software, the study requires a sample size of 134 with a medium effect size of 0.3 and a statistical power of 0.95. Hence, 152 responses were collected from this study, an adequate sample size.

3.2 Common Method Bias (CMB)

Following the guidelines of Podsakoff et al. (2003), the contents of the developed questionnaire were well-structured to mitigate CMB concerns. Adding to this, Harman's one-factor test that was conducted in SPSS 28 determined that a single factor component accounted for 44% of the cumulative variance, which falls below the suggested threshold of 50%. The findings of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity, with acceptable values of 0.919 and less than 0.001, respectively, indicate that the sample is appropriate for factor analysis.

3.3 Respondent Characteristics

The bulk of respondents (38.8%) work in other industries, with food and beverage processing coming in second with 30.9% of the total. 11.2% were engaged in the production of metal and aluminium products, while 9.9% were engaged in the processing of wood and timber. The percentages of respondents who work in the textile, pharmaceuticals/chemicals, rubber/plastic goods, and electronics industries were 4.6%, 2.6%, 1.3%, and 0.7%, respectively. With respect to job qualifications, 16.4% were purchasing/purchasing managers, 29.6% held other roles, and 36.2% were operations/production managers. The supply chain and logistics managers, at 12.5% and 5.3%, respectively, came next. In terms of educational background, the percentages with master's, intermediate/Year 11 and 12, School leaving certificate (SLC)/Secondary education examination (SEE), bachelor's, and doctorate degrees were 25.7%, 25.7%, 25%, 23%, and 0.7%, respectively. The majority of the businesses in our sample (64.5%) had between one and sixty employees, followed by those with 500 or more (16.5%) and those with 61 to 500 (19%).

3.4 Measurement of Constructs

Using a five-point Likert scale where 1 is ‘strongly disagree’ and 5 is ‘strongly agree’, ZWP was measured using five items adapted from Agyabeng-Mensah et al. (2021) and Tseng et al. (2022). CE performance was measured using six items adapted from Agyabeng-Mensah et al. (2022) and Jabbour et al. (2020). SCC was measured using seven items adapted from Baah et al. (2022) and Ramanathan and Gunasekaran (2014). Finally, we measured CEE using six items adapted from Le et al. (2024) and Cullen and De Angelis (2021).

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4. RESULTS

4.1 Assessment of Model Validity and Reliability

This study used partially least square structural equation modelling (PLS-SEM) because it has advanced features for testing relationships in predictive research (Henseler et al., 2018; Jabbour et al., 2020). According to Hair et al. (2019), variance-based structural equation modelling (VB-SEM) should evaluate the measurement model and structural model to establish model quality and suitability. Following these guidelines, we use Smart PLS 4 to perform a confirmatory factor analysis (CFA) to verify the constructs' reliability and validity ultimately proving model quality. In line with this, during bootstrapping, we used a bias-corrected and accelerated (BCa) bootstrap with 5000 subsamples and 5% two-tailed significance. The CFA results reveal that all factor loadings are over the recommended threshold of 0.70 except for CEE6 which was 0.696. Although below the threshold, CEE6 was retained in the model due to its significant contribution to model explanatory power and predictive relevance. According to Henseler et al. (2015), acceptable Cronbach's Alpha (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and Heterotrait-monotrait Ratio (HTMT) values for model reliability and validity are ≥ 0.70, ≥ 0.70, > 0.50, and < 0.85.

Table 1.

Model and structural assessment

Construct	Item	Factor loading	Outer VIF
Circular economy entrepreneurship (CEE) CA: 0.870 CR: 0.874 AVE: 0.607	CEE1	0.761	1.891
	CEE2	0.815	2.244
	CEE3	0.807	2.241
	CEE4	0.808	2.313
	CEE5	0.783	1.959
	CEE6	0.696	1.590
Zero-waste practices (ZWP) CA: 0.850 CR: 0.854 AVE: 0.625	ZWP1	0.769	1.762
	ZWP2	0.797	1.741
	ZWP3	0.835	2.152
	ZWP4	0.790	1.762
	ZWP5	0.760	1.716

Circular economy performance (CEP) CA: 0.894 CR: 0.898 AVE: 0.654	CEP1	0.801	2.179
	CEP2	0.859	2.636
	CEP3	0.784	2.017
	CEP4	0.853	2.534
	CEP5	0.724	1.735
	CEP6	0.825	2.381
Supply chain collaboration (SCC) CA: 0.885 CR: 0.890 AVE: 0.593	SCC1	0.755	1.851
	SCC2	0.738	2.014
	SCC3	0.780	2.237
	SCC4	0.717	1.756
	SCC5	0.777	2.060
	SCC6	0.817	2.142
	SCC7	0.800	2.092

Based on the data shown in Table 1, the structural model demonstrates satisfactory reliability as both the CA and CR values fall within the acceptable range of 0.850-0.894. The measuring model's validity was further assessed using the Average Variance Extracted (AVE). The results indicate that the model demonstrates convergent validity, as the AVE values fall within the range of 0.593-0.654. The model exhibits no problems with multicollinearity as the outer variance inflation factors (VIFs) were below the optimal threshold of 3. Adding to this, we evaluate the model's predict ability and its significance using the R Squared (R^2) and Stone-Geisser's Q^2, respectively. The results indicate that the model demonstrates predictive capability as it accounts for 0.270, 0.202, and 0.629 of the variability in CEE, SCC, and CE performance, respectively. The Q2 values of 0.248, 0.184, and 0.355 indicate that there is predictive relevance for CEE, SCC, and CE performance, respectively. We assessed the discriminant validity of the structural model by calculating the HTMT ratio. The HTMT ratio demonstrates that the model successfully achieves discriminant validity, since all values were below the optimal threshold of 0.850, as shown in Table 2.

Table 2.

Discriminant validity ($HTMT_{0.850}$ ratio)

Construct	1	2	3	4
1. CEE				
2. CE performance	0.818			
3. SCC	0.588	0.680		
4. ZWP	0.768	0.723	0.506	

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4.2 Hypothesis Testing

The results of the bias-corrected bootstrapping, as presented in Table 3, show that ZWP has a positively significant influence on SCC (β = 0.450, f^2 = 0.254, p = 0.000) and CE performance (β = 0.220, f^2 = 0.071, p = 0.005) suggesting support for hypotheses H1 and H2. Hypotheses H3 and H4 emphasized that SCC improves CE performance (β = 0.293, f^2 = 0.164, p = 0.000) and drives the development of CEE (β = 0.520, f^2 = 0.370, p = 0.000), respectively were supported in that the correlations between the variables were positive and significant. Furthermore, as hypothesized, we found that the development of CEE substantially enables manufacturing SMEs to identify and exploit CE-related opportunities ultimately boosting CE performance (β = 0.428, f^2 = 0.247, p = 0.000). This finding supports hypothesis H5 as depicted in Figure 2. Adding to this, the examination of the serial mediation results indicates that SCC and CEE play crucial mediating roles in enhancing ZWP for CE performance (β = 0.100, p = 0.000). Thus, hypothesis H6 was supported by the study results (See Table 3).

Table 3.

Hypothesis testing

Paths	Beta (β)	f^2	Standard Deviation	T Statistics	P Values	Inner VIFs
Direct effect						
H1(s): ZWP ➔ SCC	0.450	0.254	0.070	6.419	**0.000**	1.000
H2(s): ZWP ➔ CE performance	0.220	0.071	0.079	2.789	0.005	1.826
H3(s): SCC ➔ CE performance	0.293	0.164	0.072	4.072	**0.000**	1.409
H4(s): SCC ➔ CEE	0.520	0.370	0.068	7.679	**0.000**	1.000
H5(s): CEE ➔ CE performance	0.428	0.247	0.079	5.423	**0.000**	1.995
Serial mediation effect						
H6(s): ZWP ➔ SCC ➔ CEE ➔ CE performance	0.100	-	0.033	3.021	0.003	-

** Note. s – supported; ns – not supported; items in bold are significant*

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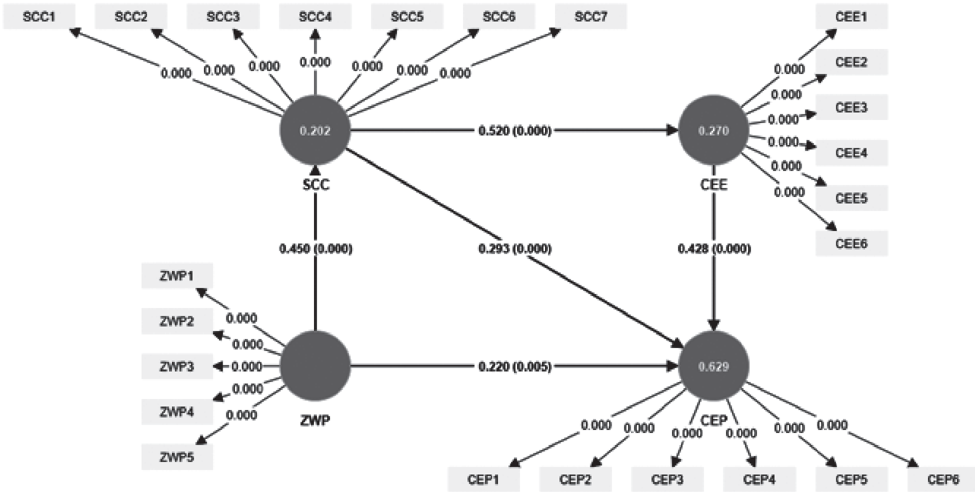
Figure 2

Structural model



5. DISCUSSION

This study examines the impact of ZWP on CE performance via SCC and CEE while also investigating the direct effect of ZWP on CE performance and SCC; SCC on CEE and CE performance; and CEE on CE performance among SMEs in Nepal. Drawing on the network theory, the result reveals that ZWP pushes SMEs to collaborate with supply chain partners in sharing or exchanging valuable resources, developing technologies and creating joint knowledge that develops technical capabilities in line with the literature (Nassani et al., 2023; Young et al., 2010). Moreover, based on the findings, SCC has a positive effect on CE performance. This finding aligns with the findings of Ramanathan and Gunasekaran (2014) and Bai et al. (2020) who highlight the important role of SCC in achieving CE performance. The finding explains that SMEs in Nepal rely on SCC due to resource constraints and consequently, supply chain partners provide SMEs with an opportunity to source CE materials and technologies that enhance product design, reduce energy consumption and associated costs and decrease environmental risk to promote CE performance. Furthermore, the study found that SCC directly affects CEE as supported by Rijal et al. (2024) and Le et al. (2024). This finding confirms that forming strong collaborations with supply chain partners facilitates continuous exploration and exploitation of new CE opportunities and develops innovative business models that promote resource conservation. In addition, this study discovered that CEE has a positive and significant influence on CE performance. CEE provides an avenue for exploring CE opportunities that aim at recycling, reusing and reducing waste generation and dependency on natural resources further improving CE performance as suggested by Baah et al. (2023). The study also confirms that ZWP directly contributes to CE performance by redesigning the product for reuse and recycling, reducing waste generation, using cleaner technologies and providing zero waste awareness training to the employees which aligns

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with other studies (Agyabeng-Mensah et al., 2021; Mungai et al., 2020). Adding to this, the study shows that ZWP positively drives SCC which develops CE entrepreneurial capabilities in achieving CE performance. This finding reinforces the essential role of ZWP in achieving CE performance in the Nepalese context which necessitates close engagement with supply chain partners to boost CE entrepreneurs' knowledge and resource base, both of which are essential for improved CE performance.

5.1 Theoretical Implications

This study contributes to the CE literature in three ways. First, this study draws on the network theory to integrate and explore the associations between ZWP, SCC, CEE and CE performance. Most studies have viewed the direct relationships of each variable and overlooked the composite effect of the ZWP-SCC-CEE-CE performance relationship. To achieve CE performance by implementing ZWP, SMEs should engage with supply chain partners for collaboration and resource acquisition to develop CE entrepreneurial capabilities that enhance CE performance. This study confirms that zero waste practices such as recycling, reusing, redesigning and reducing materials are essential for manufacturing SMEs to achieve CE performance. Second, most studies examine how CEE drives SCC, however, this study explores the SCC-CEE relationship and confirms that SCC influences CEE by facilitating resource acquisition and developing entrepreneurial capabilities. Third, studies on ZWP and CE remain under-researched in the Nepalese context. Thus, Nepal presents a novel context to investigate SMEs’ participation in zero-waste practices contributing to CE. By utilising data from manufacturing SMEs in Nepal, this study contributes to the understanding of the CE performance of emerging economies.

5.2 Practical Implications

Besides theoretical contributions, this study also provides practical contributions to SME managers and policymakers. This study urges SMEs to adopt ZWP such as recycling, reusing and reducing waste generation and dependency on raw materials to enhance CE performance. To increase the impact of ZWP on CE performance, managers are encouraged to engage with supply chain partners and extend collaboration to amass resources and form a synergistic bond which stimulates risk and benefit sharing. Furthermore, SMEs should leverage SCC to develop entrepreneurial capabilities in the CE domain. In the quest to improve CE performance, by deploying CEE, SMEs should scan the environment to identify CE opportunities and use the resources pooled from supply chain partners to exploit such opportunities. Given the significance of ZWP on CE performance, this study recommends policymakers encourage SMEs to adopt ZWP in their daily operations by introducing zero waste policies and support programs targeted to SMEs that promote sustainable practices.

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6. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

Based on the data from 152 manufacturing SMEs in Nepal, this study revealed that ZWP directly impacts CE performance and indirectly via SCC and CEE. ZWP focus on product design and production that ensures waste reduction and circularity of materials by extending product lifecycle, recycling and reusing secondary materials which minimise the negative impact of the firm's operation on the environment to achieve sustainability goals. Therefore, in this process of implementing ZWP, SME managers are encouraged to collaborate with supply chain partners enabling resource access that facilitates in development of entrepreneurial capabilities in the CE context. Moreover, by deploying CEE, SMEs can further improve CE performance.

In addition to the contributions, this study possesses some limitations. This study focuses on SMEs in the manufacturing sectors in Nepal, thus offering limited understanding and may not be generalised in large firms, other industries and countries. Future studies could extend this research to large firms, other industries and other developing countries to obtain a better understanding of CE. Furthermore, this study examined the impact of CE performance from ZWP, SCC and CEE, however, other variables may serve as critical variables in the CE context. Therefore, future research should explore other variables to deepen CE understanding.

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