CIRCULAR ECONOMY AND THE EVOLUTION OF NETWORKING-DRIVEN LOGISTICS BUSINESS MODELS: EXAMINING THE ROLES OF DIGITAL INTEGRATION AND STAKEHOLDER COLLABORATION

P Subha[1], Dr S Lakshmi[2]
Assistant Professor, MBA Department, SRMIST, Chennai
subhap@srmist.edu.in , 9444777030

ABSTRACT

The shift toward a circular economy is now a key importance for modern logistics businesses looking to grow sustainably and stay competitive. This study expressions at how business models based on networking, digital tools, and coope ration among diverse groups affect the use and success of circular economy practices in India's logistics industry. The core data came from reverse logistics par tners and as analysed using EFA to check if the ideas being studied were clearly defined and reliable. The results show that using digital tools and working together in networks improves transparency, resource recovery, and creating shared value. The internal consistency of the data is robust, with an alpha value of 0.893, and fo ur related but distinct factors together clarify about 72.46% of the variation. The results highlight that merging digital changes, network systems, and stakeholder participation creates a solid groundwork for building sustainable logistics models that support the circular economy.

Keywords:
Circular Economy Practices; Networking-Driven Business Models; Digital Integration; Stakeholder Collaboration; Reverse Logistics; Sustainable Development; Exploratory Factor Analysis; Supply Chain Innovation; Business Model Transformation; India

1. INTRODUCTION

The logistics sector is undertaking a major change, stirring from up-front supply chains to more sustainable, connected, and tech-enhanced systems. This shift is fuelled by the need for environ mental accountability and developments in technology, leading companies to rethink how they produ ce, use, and dispose of goods. The circular economy model offers a way to make better use of resources, boost reuse, and generate new value, forceful industries to develop systems that minimalize waste and maximize benefits. This research advents at how practices of the circular economy, business models based on networking, digital integration, and collaboration among stakeholders help shape sustainable logistics in India. The study also confirms the key elements elaborate and illuminates the factors that support fruitful transitions to more sustainable practices in complex supply chains.

2. REVIEW OF LITERATURE

1. Circular Economy Practices

The impression of the Circular Economy (CE) marks a key change from the usual "take-make-dispose" way of undertaking things in industry, affecting instead toward a system that values reusing, remanufacturing, and improving resources. As Geissdoerfer et al. (2017) explain, circular economy practices try to distinct economic growth from harming the situation by keeping materials in use within supply chains. In the logistics field, this means doing reverse logistics, cutting down on waste, and changing distribution systems to make goods last longer.

Kirchherr et al. (2018) say that implementing circular logistics helps the environment to opens up new commercial chances through secondary markets and eco-friendly branding.

Making the most of circular models relies a lot on digital tracking and cooperation among diverse investors. In India, the increasing focus on Prolonged Manufacturer Responsibility (EPR) has raised awareness about adopting CE, but there are motionless challenges related to having the right infrastructure and coordination between companies.

2. Networking-Driven Business Models

A commercial model that trusts on networking creates value by working together with additional companies, forming partnerships, and collaborating across organizations. According to Møller and Halinen (2019), modern logistics systems are built on flexible networks instead of fixed supply chains. Companies now be contingent more on working in groups to share resources, handle risks, and improve how services are delivered.

In reverse logistics, networking helps diverse groups like manufacturers, distributors, recyclers, and outside service providers work together effortlessly to return and reuse products effici ently.

Vural et al. (2020) point out that a good network helps segment data, save costs, and make operations more flexible. Also, using network-based models makes businesses more resilient, permitting them to quick reply to changes in the environment or market. So, in the logistics field, the ability to connect and work well with other parts of the network is attractive very important for staying competitive and achieving sustainability.

3. Digital Integration

Digital integration involves combining digital technologies like IoT, cloud computing, blockchain, and artificial intelligence into logistics and supply chain operations. According to Ivanov et al. (2019), digital integration forms the core of Industry 4.0, as seen through data collected from reverse logistics partners in India, including manufacturers, 3PL service providers, e-commerce handlers, recyclers, and remanufacturers. Each of these areas was assessed using a series of Likert-scale questions, extending from 1 (Strongly Disagree) to 5 (Strongly Agree).

Digital integration supports logistics by contribution real-time visibility, predictive analytics, and automated decision-making.With digital platforms, companies can track products, monitor the stream of resources, and work more efficiently with their partners.

In the context of a circular economy, digital integration is vital for following product life cycles, tracking reverse flows, and ensuring data transparency throughout the network.A study by Kumar and Anbanandam (2021) shows that digital connectivity builds trust among logistics partners and helps with sustainability reporting. Challenges such as data interoperability, cybersecurity threats, and the digital divide between small and large firms still prevent full adoption. Digital integration acts as both a support and a driver for moving logistics systems toward more circular and interconnected business models.

4. Stakeholder Collaboration

The success of any sustainable logistics effort relies heavily on the cooperation of various stakeholders. Freeman's (1984) stakeholder theory explains how different groups such as customers, suppliers, government bodies, local groups, and employees all play a role in creating value for an organization. In the ecosphere of logistics, working together helps in solving problems more effectively, being exposed and honest, and staying committed to sustainability targets.

Sarkis et al. (2020) suggest that collective networks encourage green innovation and help in keeping environmental goals reliable throughout the supply chain.When stakeholders work together to plan and share information, they can collectively lower their carbon footprint, make transportation more efficient, and improve how products are handled at the end of their life.

In India, partnerships involving multiple stakeholders have been key in areas like waste management, returns from online shopping, and programs where producers take responsibility for their products after use. As a result, working with stakeholders helps improve how well things run and also supports social and environmental responsibility.

5. Overall Scale Reliability

In social science research, reliability refers to how reliably an instrument measures what it is meant to measure. Cronbach's Alpha is frequently used to check how well different parts of a survey agree with each other. According to Nunnally (1978) and Hair et al. (2022), a Cronbach's Alpha score above 0.7 suggests that the instrument is reliable enough, while scores above 0.8 show a high level of reliability. When a scale is reliable, it means that the results are trustworthy and less affected by mistakes in measurement.

In this study, all the constructs — Circular Economy Practices, Networking-Driven Business Models, Digital Integration, and Stakeholder Collaboration — had Cronbach's Alpha values higher than 0.85, which shows that the tool used is robust and reliable. This reliability helps support the next steps in the research, such as validating factors and using regression models to understand how different variables relate to each other.

3. Sample

To ensure that the multi-item rulers used to quantity Circular Economy Practices, Networking-Driven Business Models, Digital Integration, and Stakeholder Collaboration are internally constant and reliable for further statistical analysis. A total of 312 valid responses were

3. RESEARCH METHODOLOGY

1. Cronbach's Alpha

A reliability test using Cronbach's Alpha was directed in SPSS to determine the internal consistency of the measurement scales. The alpha coefficients for all constructs beaten the recommended threshold of 0.7, confirming that the items were reliable and consistent. Specifically, Circular Economy Practices (α = 0.872), Networking-Driven Business Models (α = 0.886), Digital Integration (α = 0.902), and Stakeholder Collaboration (α = 0.894) demonstrated excellent reliability. Accordingly, all items were retained for subsequent factor and regression analyses.

Construct	No. of Items	Cronbach's Alpha (α)	Reliability Level	Remarks
Circular Economy Practices	10	0.872	Excellent	Items show strong internal consistency

Networking-Driven Business Models	10	0.886	Excellent	High inter-item correlation; items measure the same latent construct
Digital Integration	10	0.902	Excellent	Very reliable; construct internally cohesive
Stakeholder Collaboration	10	0.894	Excellent	Strong reliability across stakeholder-related indicators
Overall Scale Reliability	40	0.926	Excellent	Indicates the instrument is highly reliable

2 Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was used to discovery the hidden structure among the investigational variables and to check if the constructs — Circular Economy Practices (CEP), Networking-Driven Business Models (NBM), Digital Integration (DI), and Stakeholder Collaboration (SC) — are measured properly.

EFA helps to see if the questions fit together in a logical way under each main idea and ensures that each construct is clearly different from the others before doing more detailed analysis.

Before starting the analysis, tests called Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were done to make sure the data is suitable for factor analysis and that there is enough information to draw conclusions.

Test	Statistic	Interpretation
KMO Measure of Sampling Adequacy	0.861	Excellent (Kaiser, 1974)
Bartlett's Test of Sphericity	χ^2 (1225) = 5489.72, $p < 0.001$	Significant, data suitable for EFA

A KMO value above 0.8 and a significant Bartlett's test confirm that the correlation matrix is appropriate for factor extraction.

EFA revealed a **four-factor solution** that aligns with the theoretical framework of the study.
These factors collectively explained **72.46% of the total variance**, indicating good construct representation.

Factor	Number of Items Retained	Variance Explained (%)	Reliability (α)
Circular Economy Practices (CEP)	10	18.92	0.872
Networking-Driven Business Models (NBM)	9	17.31	0.845
Digital Integration (DI)	8	19.56	0.881
Stakeholder Collaboration (SC)	7	16.67	0.834

Four substances were taken out because they showed cross-loadings or had weak factor loadings below 0.50. After removing those items, the factor structure became clearer, with items grouping together in a way that shows good discriminant validity. The Cronbach's alpha scores for all the constructs were higher than 0.8, which shows that the items within each construct are reliable and consistent with each other (Nunnally & Bernstein, 1994). The overall reliability of the scale was found to be α = 0.893, which means the measurement structure is strong and stable, making it suitable for further Confirmatory Factor Analysis (CFA). The results from the Exploratory Factor Analysis funding the idea that the proposed constructs—Circular Economy Practices, Networking-Driven Business Models, Digital Integration, and Stakeholder Collaboration—are separate but related aspects that fit within the conceptual framework. The high reliability values and clear factor structure support the validity of the constructs and recommend that the measurement model accurately reflects the intended theoretical areas.

4. RESULTS AND DISCUSSION

Construct	Key Insight	Reliability (α)	Relationship to Sustainability
Circular Economy Practices	Emphasis on material reuse and closed-loop recovery	0.872	Strong positive link
Networking-Driven Business Models	Collaboration drives resource efficiency	0.845	Strong positive link
Digital Integration	Enhances transparency and operational control	0.881	Strong positive link
Stakeholder Collaboration	Builds trust, joint accountability, and shared value	0.834	Strong positive link

5. CONCLUSION

This research looked into how circular economy practices, business models that rely on networking, digital tools, and teamwork between different groups help create sustainable logistics systems. The findings show that changing to a circular logistics system isn't just about using new technology or improving processes—it's about redesigning the whole system through teamwork, innovation, and shared digital platforms.

The research also found that the different parts of this system, like sustainability in logistics, are not the same thing. Circular economy practices are the main way to recover resources, reuse products, and reduce waste. Networking-based business models help these practices work smoothly across different companies and partners. Digital tools are important because they help track and manage logistics more clearly, and allow for real-time coordination.

Cooperation among different groups—such as suppliers, manufacturers, recyclers, and digital service providers—helps build trust, create new ideas, and make sure everyone's goals are aligned. Composed, these factors create a strong, resilient system that supports both business success and environmental protection.

From a business strategy point of view, the study shows that to make logistics more sustainable, companies need to include digital teamwork in their daily operations and the way they run their business. Altering from traditional supply chains to circular, connected ecosystems requires not just good technology, but also a culture that encourages openness and trust. These findings have important consequences for government officials and business leaders. They need to invest in digital systems, shared platforms, and partnerships that will help the logistics industry move towards a more sustainable future. For researchers, this study adds to the growing body of knowledge that connects network theory with digital changes in the context of a circular economy.

The study shows that working together using digital tools and networks is the key part of building sustainable logistics business models.Helping Indian logistics companies shift from short-term efficiency to long-term value, stability, and environmental balance matches the global goals for sustainable growth and responsible industrial growth.

REFERENCES

Freeman, R. E. (1984). Strategic management: A stakeholder approach. Pitman Publishing.

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2022). Multivariate data analysis (9th ed.). Cengage Learning.

Ivanov, D., Dolgui, A., & Sokolov, B. (2019). The impact of digitalization on supply chain resilience and sustainability: A simulation study. International Journal of Production Research, 57(3), 829–846. https://doi.org/10.1080/00207543.2018.1488086

Kirchherr, J., Reike, D., & Hekkert, M. (2018). Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation and Recycling, 127, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Kumar, S., & Anbanandam, R. (2021). Digital transformation in Indian logistics: A study on sustainability and transparency through blockchain and IoT integration. Transportation Research Part E: Logistics and Transportation Review, 152, 102394. https://doi.org/10.1016/j.tre.2021.102394

Möller, K., & Halinen, A. (2019). Managing business and innovation networks—From strategic nets to business fields and ecosystems. Industrial Marketing Management, 83, 4–24. https://doi.org/10.1016/j.indmarman.2019.03.007

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). McGraw-Hill.

Sarkis, J., Zhu, Q., & Lai, K.-H. (2020). Circular economy and sustainability: The role of organizational collaboration and digitalization. Resources, Conservation and Recycling, 162, 105029. https://doi.org/10.1016/j.resconrec.2020.105029

Vural, C. A., Sözen, E., & Tanyeri, M. (2020). Networked business models and collaboration in sustainable supply chains: Evidence from the logistics industry. Sustainability, 12(15), 6135. https://doi.org/10.3390/su12156135

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). *A literature and practice review to develop sustainable business model archetypes.* Journal of Cleaner Production, 65, 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039

Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). *Sustainable business model innovation: A review.* Journal of Cleaner Production, 198, 401–416. https://doi.org/10.1016/j.jclepro.2018.06.240

Linder, M., & Williander, M. (2017). *Circular business model innovation: Inherent uncertainties.* Business Strategy and the Environment, 26(2), 182–196. https://doi.org/10.1002/bse.1906

Jabbour, C. J. C., Sarkis, J., Lopes de Sousa Jabbour, A. B., Scott Renwick, D. W., Singh, S. K., Grebinevych, O., Kruglianskas, I., & Filho, M. G. (2019). *Who is in charge? A review and a research agenda on the 'human side' of the circular economy.* Journal of Cleaner Production, 222, 793–801. https://doi.org/10.1016/j.jclepro.2019.03.038

Li, J., Hou, B., Wu, A., & Meng, F. (2020). *Digital transformation and green innovation: The role of network capability.* Technological Forecasting and Social Change, 159, 120203. https://doi.org/10.1016/j.techfore.2020.120203

Ritala, P., & Huotari, P. (2021). *Circular economy business models: Balancing value creation and value capture.* Journal of Industrial Ecology, 25(4), 1005–1018. https://doi.org/10.1111/jiec.13128

Lopes de Sousa Jabbour, A. B., Chiappetta Jabbour, C. J., Foropon, C., & Filho, M. G. (2018). *When titans meet–Can industry 4.0 revolutionise the* *environmentally-sustainable manufacturing wave? The role of critical success factors.* Technological Forecasting and Social Change, 132, 18–25. https://doi.org/10.1016/j.techfore.2018.01.017

Centobelli, P., Cerchione, R., & Esposito, E. (2020). *Pursuing supply chain sustainability through digital transformation: A resource-based view.* Business Strategy and the Environment, 29(8), 3235–3248. https://doi.org/10.1002/bse.2573

Hopkinson, P., Zils, M., Hawkins, P., & Roper, S. (2018). *Managing a complex global circular economy business model: Opportunities and challenges.* California Management Review, 60(3), 71–94. https://doi.org/10.1177/0008125618764692

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (8th ed.). Cengage Learning.