

Cloud-Based Management Solutions for Circular Economy: Transforming Supply Chain and Logistics in Pakistan

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ABSTRACT

The paper examines how Cloud-Based Management Solutions (CBMS) can facilitate the circular economy in the logistics and supply chain industry in Pakistan. The shift towards the linear models of take-make-dispose into the evidence-based circular economy models demands a radical change in the traditional supply chains, which is particularly difficult to achieve in the emerging market with infrastructural shortages and systemic fragmentation. The research is a qualitative study that incorporates an interpretivist paradigm, with ten interviews with supply chain experts in three Pakistani companies, including Daraz Pakistan (e-commerce), Packages Limited (packaging/recycling), and Systems Limited (IT solutions). Thematic analysis based on the structure of Braun and Clarke demonstrates that there are five key themes: CBMS enablement of reverse logistics, material traceability improvement, economic primacy in adoption drivers, infrastructure constraints as a critical obstacle, and contextual implementation strategy. The results prove that CBMS can enhance reverse logistics efficiency and reduce the sorting time by 40% and fuel costs by 25%, in addition to providing complete material traceability. Nonetheless, performance is limited due to the lack of digitization of ecosystems and the inability of the infrastructure. The adoption decisions are dominated by economic motives and adopted as positive externalities, instead of direct goals. The paper brings a contextualized Technology-Organization-Environment framework of emerging markets and gives practical recommendations,

such as gradual implementation in hybrid architecture, public-private collaborations, and capacity building programs to help Pakistan shift to a sustainable circular economy.

Keywords: Cloud-Based management solutions, Circular Economy, Supply Chain Management, Reverse Logistics, Pakistan.

1. Introduction

The global economy is experiencing growing resource scarcity, environmental degradation, and increased waste creation, making the linear tradition of the take-make-dispose model of life ever more unsustainable (Ajibade et al,2025; Ali et al., 2022; Farooq & Ahmad, 2023; Anser et al., 2024; Anser et al., 2025a,b; Mujtaba et al., 2025a,b; Shaikh et al., 2025a,b; Bohio et al., 2025; Sial et al., 2025; Mahmood et al., 2025). To this, the Circular Economy (CE) has become a regenerative paradigm, and seeks to place products, components, and materials into reuse, refurbishment, remanufacturing, and recycling to maintain their value. The above objectives point to the necessity of a basic change of supply chain and logistics systems, which traditional unidirectional models cannot comply with reverse flows and closed-loop activities.

These issues are especially acute in developing economies like Pakistan, where a fast increase in population, growth in consumption, and growth in solid waste production make the need to find sustainable ways of economic systems more urgent. The supply chain environment in Pakistan is much decentralized, with poor infrastructure, inadequate information-sharing, and dependence on informal recycling systems that are not regulated through formal systems (Aslam, 2020). Thus, the use of Circular Supply Chain Management (CSCM) is weak due to poor awareness, fiscal limitations, and severe shortages of digital skills. The Industry 4.0 technologies, specifically Cloud-Based Management Solutions (CBMS) (cloud ERP, IoT platforms, and advanced analytics) provide scalable and cost-effective tools in the context of limited resources to strengthen transparency, efficiency, and traceability (Dritsas et al ., 2025; Naeem, 2023; Naeem et al ., 2023; Naeem et al ., 2024; Naeem et al ., 2025a,b). Nevertheless, as the global attention to the topic increases, there is scarce empirical and context-specific evidence on CBMS-based

circularity in new economies, and available literature is dominated by developed economies.

This study fills this gap with the aim of studying the role of CBMS in facilitating circular supply chains in Pakistan with special attention to reverse logistics, material traceability, adoption drivers, implementation obstacles, and managerial and policy implications of the latter. It has become accepted in the existing literature that digital technologies and, specifically, Cloud-Based Management Solutions (CBMS) enable circular economy practices on supply chains (da Silva, 2024). Nevertheless, the vast majority of the empirical data presented is based on advanced economies, where the digital landscape is fully developed, the regulatory environment is well-established, and the informal economy is not very active. Consequently, the existing theories and models of implementation have little to apply to the new economies like Pakistan.

The barriers to adoption, namely financial constraints, low awareness, and the lack of digital skills prevails as the main obstacles to adoption in the Pakistani setting, but there is little empirical evidence of how CBMS operate in situ to support fundamental circular supply chain processes like reverse logistics and material traceability. In addition, the research on the drivers of adoption under different contexts, the problems with implementation, as well as ecosystem-level limitations, especially how infrastructure unreliability and the prevalence of the informal sector affect the issue, is limited.

The research aims of this study are as follows:

To examine how CBMS enables key circular economy functions, reverse logistics, material traceability, and asset utilization in Pakistan's supply chain and logistics sector.

To identify the key drivers and contextual factors influencing CBMS adoption and effective implementation for circularity in Pakistan.

To develop evidence-based managerial and policy recommendations for leveraging CBMS to support a scalable and resilient circular supply chain in Pakistan.

The questions below directly align with the research objectives

How do CBMS (cloud ERP, IoT, and analytics) enable reverse logistics and material

traceability in Pakistan's supply chains?

What factors drive or hinder CBMS adoption for circularity in Pakistan?

What managerial and policy actions can enable CBMS-driven circular supply chains in Pakistan?

The study is important because it offers empirical, context-specific evidence concerning the activities of the Cloud-Based Management Solutions (CBMS) in facilitating circular supply chain practices in an emerging economy (Mamun, 2025). It pushes the theory further to apply digital transformation and circular economy models to backgrounds with limited constraints in infrastructure and resources. In a practical sense, the results provide the supply chain managers with actionable advice on how to adopt CBMS to enhance reverse logistics, traceability, and operational efficiency (Nunes et al., 2025). Regulators can use the study to inform policy on what is needed to facilitate scalable circular economy transitions in terms of infrastructure, regulation, and the skills needed. In sum, the study addresses a gap in the research and provides a perspective on the global circular economy theory and concrete practices in Pakistan.

2. Literature Review

2.1 The Circular Economy and Circular Supply Chain Management

The Circular Economy is an alternative to the linear economic system that captures all its elements as a transformative and regenerative model in which products are achieved via three fundamental principles: neutralizing waste and pollution, ensuring that products and materials remain in their most productive state, and restoring a natural system (Gorokhova et al, 2023). The goal of this model is to separate economic activity and the consumption of finite resources, thus dealing with global issues such as climate change, biodiversity loss, waste buildup, and pollution. The circular economy model integrates various value retention strategies at the product life-cycle stage, that is, maintenance, reuse, refurbishment, remanufacturing, and recycling, which store dissimilar degrees of embodied worth and resource utility.

Circular Supply Chain Management (CSCM) is the key operational mechanism associated with the implementation of the principles of the circular economy (Abdallah et al., 2024). It includes the design, administration of the Supply

Chain, and optimization of the Supply Chain business to facilitate circular business such as reuse, repair, and refurbishment, remanufacturing, and recycling. The concept called CSCM is a stark contrast to the traditional Closed-Loop Supply Chain Management (CLSCM): it focuses on keeping products and materials in their optimal form throughout long periods instead of addressing historical return (Zengin et al, 2024). The CSCM implementation must be radical to include supply chain management functions such as circular design principles that enable the disassembly of products (enabled by waste) and long-lasting (recycled or renewable-source materials), and logistics competencies that successfully manage reverse flows to enable product returns, collection, and processing.

2.2 Cloud-Based Management Solutions in Supply Chain Management

Cloud-Based Management Solutions are the provision of computing services such as server, storage, database, networking, software, and analytics through the internet using accessible platforms. In a supply chain environment, CBMS is typically implemented in the form of Software-as-a-Service (SaaS) applications that facilitate such functions as demand planning and forecasting, warehouse and inventory management system (WMS), and transportation management system (TMS). The CBMS is based on the architectural backbone of distributed computing infrastructure, which allows the resources to be distributed on a large scale and make a multi-tenant services model along with ubiquitous network access to centralized data repositories and processing units.

The replacement of old on-premise Enterprise Resource Planning systems with Cloud-Based Management Systems provides many benefits that are beneficial, especially in the unstable supply chain industries (Guo, 2021). Economic success is a main advantage, turning capital expenditure (CapEx) on infrastructure into operational expenditure (OpEx) based on subscription schemes, especially beneficial to small and medium-sized companies. Scalability and flexibility also allow organizations to actively change capabilities in accordance with changing business needs without any significant investment in infrastructure. Visibility solutions in real time consider and combine data through various channels onto single platforms and provide trackability of inventories, status during production, as well as order

fulfillment control across multi-echelon networks (Tan et al,2024). Increased cooperation is created by centralized hubs that unify internal departments and outsource them to external suppliers and logistics, such as suppliers and other companies, streamlining the process of information exchange.

2.3 Digital Technologies as Circular Economy Enablers

The digital transformation is part of the conditions of circular economy transitions, and cloud solutions can serve as the basic infrastructure of data-intensive circular strategy (Mahmud, D. 2025). CBMS makes it easier to implement critical capabilities that facilitate the implementation of a circular supply chain, especially functions of visibility and traceability. As it became known, traceability, or the capability of identifying, tracking, and tracing positions and histories of products during supply chains, can be tremendously improved with the cloud-based systems that combine Internet of Things devices connected to the supply chain, real-time tracking equipment, and a blockchain-enabled system to record data. IoT devices can be used to track in real-time whether the cold chains are spoiled and identify the products that can be remanufactured, whereas cloud-based ledgers contribute to data integrity and security with the product lifecycle information, which can be used to further regulatory compliance and sustainability claims.

Another area of serious concern in which CBMS can offer significant value is in the area of reverse logistics optimization (Nunes, 2025). As part of the CSCM, reverse logistics is made more efficient with the support of new technologies, such as AI and machine learning-based cloud platforms that allow predictive analytics-driven anticipation of returns with used products, optimization of warehouse managers, and a refurbishment schedule. Cloud-based TMS can make use of smart logistics to optimize collection vehicle routing to collect waste and returns on products, use less fuel, minimize operational expenses, and engage in sustainability goals.

2.4 CBMS Adoption Challenges in Emerging Markets

Although literature explains the potential of CBMS in transforming CSCM practices, the contextual challenges in transforming the benefits in new economies such as Pakistan are different (Mahar et al .,2025). Technological and infrastructure

obstacles comprise low internet access to the speed and high-reliability connection and insufficient data center and network infrastructure, which result in fundamental obstacles to real-time data connectivity and the dependability of cloud services (Amiri, 2023). Cyber issues and skills concerns include the unavailability of a digitally skilled labor force, the unwillingness to change to new digital systems due to paper-based systems, and the expensive nature of specialized IT talents, which restricts the effective use and upkeep of multifaceted cloud platforms. Financial and security issues, such as perceived high initial expenses of migration and subscription structure, and long-term benefits of OpEX in the form of increased data integrity, privacy, and regulations, pose distrust and monetary obstacles to local SMEs and large businesses. The regulatory and policy gaps manifest as the lack of mature regulatory frameworks of cloud data governance and digital services, coupled with the limited government incentives in adopting CE and CSCM, make the adoption slow because of uncertainty and non-pro-adoption policies.

2.5 Theoretical Framework

Major adoption frameworks such as the Technology-Organization-Environment (TOE) Framework are often used to analyze cloud adoption within an organization (AlHadwer, 2023). In the case of Pakistan, environmental factors that may need to be considered are the high level of informal sector participation in material recycling, the lack of standardized product take-back systems, and energy scarcity to support the operations of data centers. Although there is strong evidence on digital tools supporting the concept of circularity in developed economies, there is still a lot to learn about empirical and situation-specific knowledge on the implementation of integrated CBMS and CSCM in emerging economies. In particular, there is a lack of qualitative research that examines how firms change and restructure international cloud-based CSCM strategies to overcome infrastructural and regulatory peculiarities of the Pakistani supply chain and logistics environments (Nosheene et al., 2025).

2.6 Conceptual Framework

The conceptual framework in this study covers the connection that exists between Cloud-Based Management Solutions (CBMS) and Circular Economy (CE) activities

in the Pakistan supply chain and logistics industry. CBMS, such as cloud ERP, IoT platforms, and analytics, is the independent variable, which will allow making decisions in real-time, integrating data, and managing lifecycle decisions. Reverse logistics efficiency and material traceability are two key CE functions, which are the dependent variables. Contextual adoption barriers, such as the unreliability of infrastructure, lack of digital skills, high costs of migration, data security, and enforced weak regulations, mediate this relationship and have an effect on the degree of CBMS influence on circular performance.

3. Methodology

3.1 Research Design and Philosophy

This exploratory, qualitative study is a case study of the way Pakistani supply chain and logistics organizations use Cloud-Based Management Solutions (CBMS) to achieve the objectives of a circular economy (Soomro et al., 2025). The qualitative methodology operationalizes complicated relations that exist among technology, organizational resources, and environmental forces in the new market. The research is guided by an interpretivism paradigm, which acknowledges that the adoption of technology is a socially constructed phenomenon based on the interactions of an organization (William et al., 2024).

3.2 Research Approach and Sampling

A multiple case study design will allow organizational analysis and cross-case comparison. The researchers were selective in the sample; it was an interview-based study that focused on senior-level managers (Manager to Director) with supply chain management, logistics, digital transformation, or sustainability divisions across medium and large Pakistani companies implementing or planning to implement cloud-based services. The purposive sampling method merged expertise sampling and maximum variation methods to guarantee information-rich sources in different organizational environments (Ahmad et al., 2025)

Theoretical principles of saturation were used to decide the sample, which was 10-15 semi-structured interviews. The sample of the final survey included a total of ten participants in three organizations, namely Daraz Pakistan (e-commerce), Packages Limited (packaging/recycling), and Systems Limited (IT solutions).

3.3 Target Organizations

The following criteria were used to select organizations: (1) cloud technology use/planned cloud technology use (Cloud ERP, WMS/TMS, IoT platform or analytics); (2) presence in the active operations of the circular economy (reverse logistics, material traceability, recycling/refurbishing or waste minimization); and (3) the presence of significant operations in the local supply chain in Pakistan.

Daraz Pakistan is the largest e-commerce site in the country, which is based on Alibaba Cloud and has considerable reverse logistics possibilities. Packages Limited is the most prominent company of Pakistan that deals with sustainable packaging and recycling of papers with an emphasis on the post-consumption of materials. Systems Limited, the leading IT solutions provider, also uses cloud ERP, WMS, and TMS solutions (Oracle Cloud, SAP, Microsoft Dynamics) in the law-associated industries and offers the perspectives of the vendor on the implementation issues.

The topics examined in semi-structured interviews: the level of digital transformation and the use of cloud-based SCM; the implementation of the circular economy; perceived barriers and enablers; reverse logistics practices; challenged traceability; as well as infrastructure/policy concerns.

3.4 Data Collection and Analysis

The sources of secondary data encompassed organizational documents (annual reports, sustainability policies, operational manuals), industry reports, and peer-reviewed materials (2020-2025) related to the topics of the circular economy, cloud technologies, and emerging market supply chain.

Thematic analysis was based on the six-stage model of Braun and Clarke (2006) familiarization; (2) initial coding; (3) theme identification; (4) theme review; (5) theme definition; (6) report writing. NVivo 12 helped code and visualize the data that promoted rigor and transparency.

4. Findings

The chapter explains and discusses the research results of semi-structured interviews with ten high-level professionals representing the chain of supply and logistics of Pakistan. The involved organizations, namely, Daraz Pakistan, Packages

Limited, and Systems Limited, were chosen to find the views of e-commerce logistics, manufacturing, and recycling, and cloud technology application, respectively.

4.1 Participants Profile

Ten participants were selected based on three major organizations in the supply chain, logistics, manufacturing, and cloud technology ecosystem of Pakistan, namely Daraz Pakistan, Packages Limited, and Systems Limited. The participants were all top managers or technical professionals and had extensive professional experience, which made their opinions about the adoption and use of Cloud-Based Management Solutions (CBMS) to implement the circular economy informed and strategic.

In the e-business case of Daraz Pakistan, the number of interviewees and respondents was four, including a Supply Chain Director (P1), Reverse Logistics Manager (P2), Head of Technology (P3), and Warehouse Operations Manager (P4), all with seven and up to twelve years of experience in their respective fields. Their contributions provided an overall view of how cloud-based solutions contribute to large-scale returns processing, inventory control, and digitalization. The three participants who were chosen to represent the manufacturing, packaging, and recycling sectors worked at Packages Limited, and their information included an Operations Manager (P5), R&D Head (Sustainability) (P6), and Supply Chain Director (P7), all having more than 10 years of experience. Their perspectives especially came in handy in revealing the purpose of CBMS in facilitating material traceability, recycling activities, and closed-circuit supply chain operations.

4.2 Emerging Themes

Theme 1: CBMS Enablement of Reverse Logistics

Cloud-Based Management Solutions (CBMS) have greatly enhanced reverse logistics in the disjointed supply chain situation in Pakistan. Respondents stated that the cloud-based Transportation Management Systems (TMS) provided the organizations with the ability to have end-to-end visibility of customer returns, including their collection to refurbishment functionality, which did not exist in legacy ones (P1, P10). In the past, reverse logistics was a black hole of a process, poorly managed, leaving much to be desired in recovered value.

The major advantages were that it reduced manual sorting in the course of 40

percent by creating automated routing using machine-learning (P2), fully integrated with third-party logistics (P4, P10), predictive analytics to predict the volumes of returns in the course of sales events (P1), and save in the range of 25 percent of fuel by means of driving route optimization (P2). Instead of relying on manual inspection to determine the condition, product type, and refurbishment economics of returned products, automated sorting was used to make sure more valuable product is recovered, and less is sent to the recycling streams where it is not needed (P2, P9).

There was also ecosystem-level coordination provided by cloud architecture. The returned items were scanned at the customer location, and using mobile devices, the data became immediately available at warehouses, refurbishment units, and recycling facilities, and were used to plan the capacity proactively and allocate resources within geographically spread operations (P4, P8, P10). Predictive analytics additionally improved the bottlenecks when demand was high, hence this is very important in a high-cost-of-fuel and congested logistics setup in Pakistan (P1, P2). Nonetheless, the respondents indicated the evident interface constraints between formal and informal sectors. After the materials had passed through the informal recycling and waste management systems, the traceability was substantially reduced (P6, P7). This observation confirms previous studies that the circular supply chain in emerging economies is slightly limited by the digitization of the ecosystem at the beginning stages, as opposed to the capability of an organization (Farooque et al., 2019). Respondents highlighted the fact that solving this dilemma needs policy-based formalization processes that should retain livelihoods but at the same time allow digital transparency (P7, P10).

Theme 2: Material Traceability Enhancement

The cloud platforms facilitate transparency, which is crucial in circular manufacturing. The participants also indicated that cloud-based ERP systems that are used in combination with IoT technologies allow tracking the lifecycle of products, suppliers, and recycling, and monitor the moisture, contamination, and other quality indicators in real-time (P6, P7). The quality tracking, which is supported by clouds, will ensure that recovered materials are recreated to specifications required in the remanufacturing process, and shared visibility between

suppliers, customers, and recyclers through collaborative cloud platforms (P5, P9). More so, automated traceability functionalities make sustainability reporting and the regulator compliance process much easier (P8).

Although they have these benefits, the participants affirmed that traceability often fails or collapses at the organizational borders where the supply chain partners are on non-digital systems or paper-based networks, leaving unique blind spots in material movements (P5, P7). The associated heterogeneity in ecosystem-level digital maturity significantly impairs end-to-end traceability in the Pakistani ecosystem, which supports the claim that traceability efficacy is contingent on ecosystem-wide digitization, but not sector firm competencies.

Theme 3: Economic Primacy in Adoption Drivers

CBMS adoption is mainly motivated by economic and operational factors in Pakistan, with secondary influence coming into play from environmental motivation. Instead of environmental performance, the participants pointed out that ROI is measured in terms of cost savings and inventory optimization, scalability, and waste disposal. According to one of the technology leads, this was because ROI was checked on efficiency in operations and not environmental metrics (P8).

This indicates logical investment behaviour where resources are scarce, and the financial pressure is high to invest in CBMS so as to provide clear returns in operational processes (P1, P9). Scalability of operations became a winning point, especially with respect to e-commerce, where the rapid expansion rendered a manual process of returns infeasible, and cloud solutions became the sole scalable entity (P2, P4). This need-based adoption is in contrast to the sustainability-based investments, which are usually reported in the developed economies. Other motives were competitive forces, experience through the COVID-19-related disruptions, and regulatory expectations. Respondents added that traceability in the cloud has ceased being a competitive advantage and has become a market entry prerequisite amongst international customers (P7, P10). Companies also cited initiating compliance capacity before stricter regulations came into view, due to the expense and inconvenience of having to do it afterward (P6).

All in all, the results point to how the benefits of the circular economy in the less

developed markets are mostly positive by-products of the efficiency-induced digital change, and it is necessary to consider the role of the circular economy implementation through the prism of business value rather than environmental rhetoric (Garcia-Buendia et al., 2024).

Theme 4: Infrastructure as Critical Constraint

The limitations to the effective use of clouds in Pakistan are environment-specific issues that support the implementation of the Technology-Organization-Environment (TOE) framework focus on the environmental background. Among the criteria identified by the participants were infrastructure inefficiency, such as low internet connectivity outside major cities and unreliable power supply that necessitates power generators, which somewhat de facto homicide the operational cost benefits of cloud systems (P3, P8).

Lack of digital skills reduces adoption as well, where combined cloud and supply chain professionals are hard to find (P9), but high migration costs make SMEs avoid incurring long-term benefits (P10). Another common point that was made by participants was the fact that weak cloud performance can be greatly degraded due to the digitization of the ecosystem level, where partners of the supply chain were dependent on paper-based systems; they said that the weakest team member dictates the overall performance (P5, P7).

The other obstacles encompassed organizational resistance to workflow changes (P4), the problem of data security in regard to sharing cloud data (P3, P8), and regulatory ambiguity on cloud governance and circular economy reporting (P6). All these findings are pointers to the notion that infrastructure issues are not only isolated to access limitations, but also include the hardships of hidden costs in the process of watering down the value propositions of the clouds. They also indicate that the adoption of firms remains crucial, but not enough without the coordination of the ecosystem (to allow systemic digital and circular change) (P7, P10).

Theme 5: Contextualized Implementation Requirements

Pakistan needs context-specific implementation strategies to succeed in CBMS deployment, as that is not the same as the best practices of the developed economy. The participants reiterated the importance of phased migration, which started with

non-critical modules and then merged to core supply chain modules as the most practical solution to risk and cost management (P3, P8). The hybrid setups, in which the most important information is stored on-premises, and analytics are handled in the cloud, were expected to be a great long-term setup but not a compromise to the transitional one, as the dominant beliefs supported the latter (P9, P10).

The participants identified the importance of the public-private collaboration in speeding up the adoption process in specific ways, such as government cooperation with the cloud providers to develop the local data centers and subsidize the migration costs of the SMEs (P6, P8). The use of industry consortia that facilitate common cloud platforms also came up as a factor that will cut on investment on a per-firm basis and enhance digitization on an ecosystem-wide scale (P5, P7).

Capacity building became one of the critical enablers, and the participants emphasized the importance of new university curricula, professional qualifications, and more extensive incorporation of cloud computing and circular supply chain principles (P9, P10). Policy transparency, especially that of Extended Producer Responsibility (EPR), was seen as a possible demand-side mechanism in the adoption of a traceability system (P6, P7). Lastly, participants noted that international case examples are not the key to fostering managerial belief and hastening the speed at which this can be adopted in the Pakistani environment, as local success stories are the way to do so (P1, P8).

4.3 Discussion of Findings

The results show that Cloud-Based Management Solutions (CBMS) have an enabling critical role in enhancing the circular economy practices in the supply chain and logistics sector in Pakistan. Nevertheless, the impact of their functionality is heavily influenced by situational factors, such as the reliability of infrastructure, digitalization at the ecosystem level, and economic factors. Operational efficiency and scalability are the main reasons to adopt, and not environmental incentives, and the positive externalities of the process of digital transformation are circular outcomes. The implications of the findings are demonstrated to be that firm-level technological competence does not help enough, and the needs coordination of the

ecosystem-wide level to reach end-to-end circularity.

5 . Conclusion

Cloud-Based Management Solutions provide a promising avenue to facilitate the introduction of the practice of the so-called circular economy in Pakistan; although it requires location-sensitive solutions, coordination on the ecosystem level, and favorable policy frameworks. The delivery of a circular outcome is best met, in emerging economies, when digital transformation is implemented in accordance with operational efficiency, scalability, and competitive necessity as opposed to environmental rationale alone.

5.1 Theoretical Contributions

The work contributes to the Technology-Organization-Environment (TOE) framework by proving that the situation as an environmental reality, specifically the infrastructural reliability, the level of ecosystem digitalization, converts into a powerful moderating factor in the emerging economies. It also adds by demonstrating that the implementation of the circular economy in these settings is on an efficiency line pathway and not a sustainability pathway. The results also contradict existing beliefs that support the idea of complete adoption of the fully public clouds, and hybrid cloud designs are found to be structurally optimal in the context of the resource-limited setting.

5.2 Managerial Implications

Among practitioners, the findings imply the idea that CBMS must be taken as a strategic enabler but not as an IT investment as such. Phased implementation strategies, hybrid architectures, and workforce upskilling should be the main priorities of managers to maximize returns. Partnerships with supply chain members and engagement in industry conglomerations are the essential factors to breaking the ecosystem-wide digitization gaps and improving circular sustainability.

5.3 Policy Implications

Policymakers can expedite the process of CBMS adoption by enhancing the reliability of digital infrastructure and power infrastructure, offering financial incentives to SMEs, and ensuring the development of local cloud infrastructure. Regulatory transparency, especially on the Extended Producer Responsibility (EPR)

and digital reporting principles, can be a demand pull factor for traceability systems. A further way to scale transitions to the circular economy could be enhanced through public-private cooperation and skills development.

6. Limitations and Future Research

Although there are positive contributions of this study, the research has a number of limitations that must be recognized. To begin with, the study takes the qualitative approach, with a comparably small sample of respondents, which lowers the statistical extrapolation of the results. Although the strategy allowed investigating the perceptions of managers and contextual dynamics in detail, research in the future can use a quantitative approach to test the relationship established in the study as well as its spread among a more representative sample of firms.

Second, it only refers to Pakistan, one of the emerging economies with unique institutional, infrastructural, and socioeconomic attributes. Despite the knowledge gained in the context, it might not be applicable directly in other developing or established economies. Future studies may take the comparative cross-country design so as to look at the interaction between regulatory environment differences, the maturity of infrastructures, and the role of the informal sector in the adoption of CBMS, while examining the impacts of regulatory factors on a circular economy.

Third, the research only represents organizational views at one time. Since the digital transformation and adoption of the circular economy are relatively dynamic and evolving processes, longitudinal research designs would enable researchers to observe how the motivations, implementation strategies, and performance results evolve, especially as regulatory frameworks and digital ecosystems evolve.

Lastly, future studies can delve into the sector-specific differences in the adoption of CBMS, especially through industries having different degrees of regulatory pressure, degree of returns, and potential for material recovery. Such work would contribute to the further development of theory as well as provide more specific managerial and policy advice.

References

- Abdallah, A. B., Al-Ghwayeen, W. S., Al-Amayreh, E. M., & Sweis, R. J. (2024). The impact of green supply chain management on circular economy performance: The mediating roles of green innovations. *Logistics*, 8(1), 20.
- Ahmad, M., & Wilkins, S. (2025). Purposive sampling in qualitative research: A framework for the entire journey. *Quality & Quantity*, 59(2), 1461-1479.
- Ajibade, T. F., Kumar, P., Adelodun, B., Fadugba, O. G., & Adewumi, J. R. (2025). The Sustainability Shift: Addressing Environmental Degradation Through. *Circular Economy and Environmental Resilience: Solutions for a Sustainable Tomorrow, Volume 1*, 167.
- Al Hadwer, A., Tavana, M., Gillis, D., & Rezanian, D. (2021). A systematic review of organizational factors impacting cloud-based technology adoption using the technology-organization-environment framework. *Internet of Things*, 15, 100407.
- Ali, S., Murtaza, G., Hedvicakova, M., Jiang, J., & Naeem, M. (2022). Intellectual capital and financial performance: A comparative study. *Frontiers in Psychology*, 13, 967820.
- Amiri, Z., Heidari, A., Navimipour, N. J., & Unal, M. (2023). Resilient and dependability management in distributed environments: A systematic and comprehensive literature review. *Cluster Computing*, 26(2), 1565-1600.
- Anser, M. K., Naeem, M., Ali, S., Ali, S., & Javid, R. (2025). The relationship between artificial intelligence and environmental performance: the mediating role of external environmental factors. *Humanities and Social Sciences Communications*, 12(1), 1-7.
- Anser, M. K., Naeem, M., Ali, S., Ali, S., & Larik, A. (2025). Exploring the relationship between TMT behavioral integration and environmental performance in Pakistani SMEs: a study of green innovation, green dynamic capabilities, and green finance. *Humanities and Social Sciences Communications*.
- Anser, M. K., Naeem, M., Ali, S., Huizhen, W., & Farooq, S. (2024). From knowledge to profit: business reputation as a mediator in the impact of green intellectual capital on business performance. *Journal of Intellectual Capital*, 25(5/6), 1133-1153.

- Aslam, S. (2020). Sustainable Collaboration; Transforming Alliances for EPR in non-OECD Context: A case of Pakistan. *IIIEE Master Thesis*.
- Bohio, K. K., Shaikh, F., Amin, M. S., & Naeem, M. (2025). From Green Policies to Performance: How Digitalization and Innovation Transform Organizational Outcomes in industry 4.0 of Pakistan. *Journal of Business and Management Research*, 4(4), 800-816.
- da Silva, D. M. P. (2024). Cloud-Based Documental Management System Applied to the Supply Chain Area: A Bibliometric Review Analysis. *PQDT-Global*.
- Dritsas, E., & Trigka, M. (2025). A survey on the applications of cloud computing in the industrial internet of things. *Big data and cognitive computing*, 9(2), 44.
- Farooq, M., & Ahmad, N. (2023). Nexus between board characteristics, firm performance and intellectual capital: an emerging market evidence. *Corporate Governance: The International Journal of Business in Society*, 23(6), 1269-1297.
- Farooq, M., Noor, A., & Naeem, M. (2023). Does family ownership moderate the relationship between board characteristics and corporate social responsibility? Evidence from an emerging market. *Asian Journal of Business Ethics*, 12(1), 71-99.
- Gorokhova, T., Shpatakova, O., Toponar, O., Zolotarova, O., & Pavliuk, S. (2023). CIRCULAR ECONOMY AS AN ALTERNATIVE TO THE TRADITIONAL LINEAR ECONOMY: CASE STUDY OF THE EU. *Environmental & Social Management Journal/Revista de Gestão Social e Ambiental*, 17(5).
- Guo, Y. (2021). *Transformation from On-Premise Software to Cloud Computing-Based Services: A Case Study of SAP Practices*. The University of Manchester (United Kingdom).
- Khan, N., Naeem, M., & Siraj, M. (2024). Evaluating Green Supply Chain Performance Using Multi-Criteria Decision-Making (MCDM) Models. *RADS Journal of Business Management*, 6(2), 113-123.
- Mahar, A. S., Zhang, Y., Sadiq, B., & Gul, R. F. (2025). Sustainability transformation through green supply chain management practices and green innovations in Pakistan's manufacturing and service industries. *Sustainability*, 17(5), 2204.
- Mahmood, M. T., Khan, M. K., & Naeem, M. M. (2025). ESG PRACTICES AND

- FINANCIAL DERIVATIVE PERFORMANCE: MEDIATING ROLE OF CORPORATE REPUTATION AND MODERATING ROLE OF INVESTOR AWARENESS. *Journal of Business and Management Research*, 4(4), 160-176.
- Mahmud, D. (2025). An IOT-Enabled Decision Support System for Circular Economy Business Models: A Review Of Economic Efficiency and Sustainability Outcomes. *American Journal of Scholarly Research and Innovation*, 4(01), 250-286.
- Mamun, M. M. (2025). Circular Economy and Digital Supply Chain: The role of emerging technologies for facilitating sustainability.
- Memon, S., Shaikh, M. R., & Naeem, M. M. (2025). Board Diversity and Green Innovation: A Systematic Literature Review. *Advance Journal of Econometrics and Finance*, 3(3), 158-165.
- Mujtaba, M., Naeem, M., & Khan, K. (2025). Driving Sustainability through Leadership: Psychological Empowerment of Employees as a Mediator in SMEs. *Bulletin of Management Review*, 2(3), 197-210.
- Mujtaba, M., Naeem, M., & Khan, K. (2025). From Leadership to Performance: Exploring the Pathway through Psychological Empowerment and Job Satisfaction in Developing Economies. *Journal of Management & Social Science*, 2(5), 166-183.
- Naeem, M. (2023). Corporate governance mechanism and financial performance in Pakistan commercial banks: moderating role of credit risk management. *RADS Journal of Business Management*, 5(2), 95-112.
- Naeem, M., Ali, S., & Ahmed, N. (2025). From Inclusive Finance to Efficiency: The Transformative Role of Artificial Intelligence in Pakistan's Fintech-Enabled Banks. *Journal of Banking and Social Equity (JBSE)*, 4(1), 44-54.
- Naeem, M., Ali, S., Islam, M., & Rehman, A. (2024). Does Intellectual Capital mediate the relationship of Artificial Intelligence Investment, and Firm Value in Pakistani Non-Financial Firms?. *NICE Research Journal*, 17(3), 63-76.
- Naeem, M., Amin, M. S., & Ali, S. (2025). From Knowledge to Growth: Investigating Intellectual Capital's Impact on Financial Sustainability in Emerging Economies. *Journal of Management & Social Science*, 2(2), 333-346.
- Naeem, M., Rehman, A., Mehboob, A., & Abdali, A. S. (2023). Corporate Social

- Responsibility's Hidden Power in context of Pakistan: Amplifying Firm Performance. Sukkur IBA Journal of Management and Business, 10(2), 57-76.
- Naeem, M., Siraj, M., Ali, S., Rehman, A., & Farooq, S. (2025). The Role of Artificial Intelligence in Risk Management: Practices of the Banking Sector. In *Generative AI for Web Engineering Models* (pp. 83-106). IGI Global.
- Nosheen, A., Omar, M. A., & Hashim, K. F. (2025). Investigating the Determinants of Cloud Computing-Software as a Service Adoption in Pakistani SMEs from the Perspective of SME Managers. *Journal of Advanced Research Design*, 127(1), 32-48.
- Nunes, L. J. (2025). Reverse logistics as a catalyst for decarbonizing forest products supply chains. *Logistics*, 9(1), 17.
- Nunes, L. J. (2025). Reverse logistics as a catalyst for decarbonizing forest products supply chains. *Logistics*, 9(1), 17.
- Shahab, S., Khan, K., & Naeem, M. (2025). The Power of Generative AI in Shaping Green and Responsible Supply Chains: Rethinking and Advancing Sustainable Solutions for Social Change. *Journal of Business and Management Research*, 4(4), 800-817.
- Shaikh, F., Sial, A., Khan, K., & Naeem, M. (2025). FinTech-Enabled HR Payroll Automation and Its Effect on Employee Satisfaction and Brand Image. *Advance Journal of Econometrics and Finance*, 3(4), 74-83.
- Shaikh, M. R., Ali, M. I., Tunio, M. M. S. M., & Naeem, M. M. (2025). Green Human Resource Management and Sustainability Performance: A Systematic Review Using PRISMA Methodology. *Journal of Management & Social Science*, 2(3), 330-344.
- Sial, A., Khan, M. K., & Naeem, M. M. (2025). Green Finance, Business Reputation and Sustainability Performance: Evidence from Pakistan. *Bulletin of Management Review*, 2(3).
- Soomro, M. A., Khan, S., & Shah, A. (2025). Cloud-Enabled Supply Chain Integration for Sustainable Firms: An Empirical Study on Technology and the Circular Economy Relationship. In *Innovation and Sustainability Through Circular Economy in Businesses* (pp. 65-90). IGI Global Scientific Publishing.

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Tan, Y., Gu, L., Xu, S., & Li, M. (2024). Supply Chain Inventory Management from the Perspective of “Cloud Supply Chain”—A Data Driven Approach. *Mathematics*, 12(4), 573.

William, F. K. A. (2024). Interpretivism or constructivism: Navigating research paradigms in social science research. *Interpretivism or Constructivism: Navigating Research Paradigms in Social Science Research*, 143(1), 5-5.

Zengin, M., Amin, S. H., & Zhang, G. (2024). Closing the Gap: A Comprehensive Review of the Literature on Closed-Loop Supply Chains. *Logistics*, 8(2), 54.