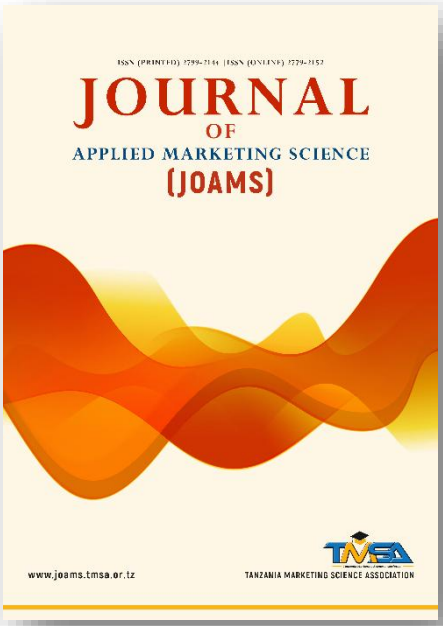


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ASSESSMENT OF HOW SMES CLUSTERS ARE DRIVING ECONOMIC SUSTAINABILITY

Emmanuel Chao[1*] Nashwat Hamis[1], Lwako Lubida[1] and Marry Mushi[1]

[1]School of Business, Mzumbe University, P.o.box 6, Mzumbe-Morogororo-Tanzania
**Corresponding Author: Email:ejchao@mzumbe.ac.tz; Cell: +255 757 588 424*

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ASSESSMENT OF HOW SMES CLUSTERS ARE DRIVING ECONOMIC SUSTAINABILITY

- *Emmanuel Chao, Nashwat Hamis, Lwako Lubida and Marry Mushi*

Abstract

SMEs are playing an important role in the national development especially in developing and emerging markets but how they coordinate among themselves is of equal relevance. This study aims at assessing how SMEs clusters are driving the economic sustainability. The specific drivers for economic sustainability which the study investigates are innovation, knowledge spillovers, collaboration, and competitiveness. A mixed methods research design was employed, combining quantitative survey data from 178 SME respondents with qualitative insights from interviews and focus group discussions.

The results from analysis indicated that cluster innovation, cluster knowledge spillover, cluster collaboration and cluster competitiveness had a positive impact on economic sustainability. Further, the study has also shown cluster competitiveness as the strongest predictor of sustainability outcomes, followed by innovation, collaboration, and knowledge spillovers. Qualitative findings reinforced these results, illustrating how SMEs benefit from joint initiatives, shared resources, inter-firm learning, and competitive pressures that drive efficiency and long-term viability.

The study concludes that SME clusters in Tanzania are powerful drivers of economic sustainability, contributing to productivity growth, inclusive development, and environmental responsibility. The findings emphasize the need for supportive policies and institutional frameworks that strengthen cluster networks, foster innovation, and encourage sustainable practices. This research provides both theoretical and practical contributions, offering a framework for understanding cluster dynamics in developing economies and guiding policymakers, cluster managers, and entrepreneurs toward strategies that align competitiveness with sustainable development.

Introduction

Small and medium-sized enterprises (SMEs) are crucial for accelerating industrial development. Research from previous studies has shown the significance of clustering in the growth of SMEs (Cerchiello& De Giovanni, 2012; Jevwegaga et al., 2018; Munyawarara& Govender, 2020). Clusters refer to the agglomeration of interrelated firms and related institutions. Clusters are the home for businesses that prioritise innovation and gain a competitive advantage from business networks and an integrated support system (Ibarra et al., 2022). Furthermore, clusters are suitable grounds for the growth of a network for private and public domestic institutions that support the local

economy's growth, which promotes group learning and innovative behaviour via coordination carried out both implicitly and explicitly (Foghani et al., 2017). Industrial development is impacted by SMEs' engagement with the cluster ecosystem, but understanding the reasons for variations in involvement and results from participating SMEs is crucial for improving cluster alignment (Ghisetti and Pedraza, 2018).

Small and Medium Enterprises (SMEs) cluster are geographically concentrated groups of interconnected businesses, suppliers, and supporting institutions which play a vital role in promoting economic sustainability (Porter, 1998; Schmitz & Nadvi, 1999). Their impact can be understood across several dimensions. SME clusters enhance regional economic resilience by creating diverse yet interconnected business ecosystems. When firms collaborate and share resources, they are better equipped to withstand market shocks, adapt to changing conditions, and maintain steady employment (Becattini, 2004; Giuliani, Pietrobelli, & Rabellotti, 2005).

Clusters also stimulate local value addition, encouraging reinvestment within the community, which strengthens local economies over the long term (OECD, 2019).Clusters foster knowledge spillovers and collaboration, enabling SMEs to innovate more effectively than if they were isolated (Maskell & Malmberg, 2007). The close proximity of firms, training institutions, and research centers encourages rapid technology adoption, process improvements, and product diversification (Bell & Albu, 1999). This innovation capacity supports long-term competitiveness and reduces overdependence on a single market or resource, which is critical for sustainability (Porter, 2000).

By sharing infrastructure, logistics, and support services, SME clusters can reduce operational costs and improve resource efficiency (McCormick, 1999). Collective purchasing, waste recycling initiatives, and shared renewable energy solutions contribute to lower environmental footprints, aligning with sustainable production practices (UNIDO, 2013). Clusters generate sustained employment opportunities by nurturing entrepreneurial ecosystems that support start-ups and small-scale producers (Nadvi & Barrientos, 2004). They promote inclusive growth, as SMEs often employ local labor and integrate marginalized groups, thus fostering social stability and reducing economic inequality, which are the key pillars of sustainability (World Bank, 2020).

Through cooperation, SMEs in clusters can more easily access new markets, participate in global value chains, and meet international standards (Humphrey & Schmitz, 2002). This collective strength increases export potential, attracts investment, and ensures the long-term viability of local industries in the face of globalization (OECD, 2019).

Theoretical Perspectives

1. Cluster Theory and Competitive Advantage

Porter's Cluster Theory posits that geographically proximate groups of interconnected firms, suppliers, and institutions enhance competitiveness and productivity through collaboration, competition, and innovation (Porter, 1998; Porter, 2000). Clusters create a dynamic

environment where SMEs can share resources, access specialized labor, and develop niche markets. From a sustainability perspective, this theory suggests that clusters can sustain long-term economic growth by fostering innovation-driven competitiveness, which is less dependent on resource exploitation and more on knowledge and technological advancement (Becattini, 2004).

The roots of cluster thinking can be traced back to Alfred Marshall's concept of "industrial districts," which highlighted the benefits of geographical proximity for sharing skilled labor, specialized suppliers, and industry-specific knowledge (Marshall, 1920). Porter expanded this view, emphasizing that clusters thrive on both competition which drives firms to innovate and collaboration which enables cost-sharing, knowledge transfer, and joint marketing (Porter, 1998).

The competitive advantages generated by clusters are often more sustainable than those achieved by isolated firms because they are embedded in local networks, relationships, and infrastructure that are difficult for competitors in other locations to replicate (Becattini, 2004). Over time, clusters develop reputational capital, making them attractive to investors, buyers, and skilled workers, further reinforcing their market position.

For Small and Medium Enterprises (SMEs), cluster participation can be transformative. SMEs often face limitations in resources, market reach, and innovation capacity when operating alone. This cooperative advantage allows SMEs to compete more effectively with larger firms while maintaining flexibility and responsiveness to market changes.

Cluster theory has significant implications for economic policy and regional development strategies. Governments and development agencies often invest in infrastructure, vocational training, and networking platforms to strengthen cluster competitiveness (OECD, 2019). For firms, especially SMEs, understanding cluster dynamics enables them to align strategies with the collaborative opportunities and competitive pressures inherent in their industrial environment.

2. Industrial District Theory and Localized Development

The Industrial District Theory, pioneered by Marshall and later expanded by Becattini (1990; 2004), emphasizes the socio-economic embeddedness of firms in specific localities. In SME clusters, dense networks of trust, cultural norms, and cooperation emerge, leading to collective efficiency (Schmitz & Nadvi, 1999). This local embeddedness enables economic sustainability through the retention of value within communities, reduction of capital flight, and reinforcement of local supply chains. Over time, such social capital supports resilience against external shocks and market volatility (Giuliani, Pietrobelli, & Rabellotti, 2005).

The Industrial District Theory, originating from the work of Alfred Marshall (1920) and later expanded by Giacomo Becattini, offers a framework for understanding how geographically concentrated networks of firms drive localized economic development. An industrial district is more than a mere collection of enterprises; it is a socio-economic entity where a community of people and a population of firms coexist in a defined area, sharing production traditions, skills, and cultural values (Becattini, 1990; 2004). Marshall (1920) observed such districts in English manufacturing towns and highlighted the benefits of external economies of scale**,** including a concentration of specialized labor, the presence of industry-specific suppliers, and the diffusion of tacit

knowledge through informal interactions. Becattini (1990) further emphasized the social embeddedness of these economic systems, where trust, cultural norms, and cooperative behavior underpin commercial relationships.

Industrial districts promote localized development through collective efficiency, which Schmitz (1995) defines as the combination of local external economies and deliberate joint action that enhances competitiveness. Social capital plays a critical role by reducing transaction costs, enabling collaboration, and encouraging resource sharing, such as machinery, expertise, and market information (Schmitz & Nadvi, 1999). In addition, localized supply chains enable faster delivery times, greater production flexibility, and lower transportation costs, all of which enhance the resilience of local economies (Giuliani, Pietrobelli, & Rabellotti, 2005). From a sustainability perspective, industrial districts help retain wealth within the community, as locally owned SMEs often reinvest profits into infrastructure, education, and skill development. They also foster resilience to external shocks through mutual support networks and the ability to quickly reconfigure production in response to market changes (Nadvi, 1995), while preserving artisanal and technical skills that might otherwise disappear.

For SMEs, participation in an industrial district offers multiple benefits, including easier integration into larger value chains without losing autonomy, accelerated innovation through proximity to suppliers and research institutions, and reduced entry barriers for new entrepreneurs who can draw on established networks and skilled labor pools (Bell & Albu, 1999). Policymakers inspired by the industrial district model often invest in infrastructure, promote cluster governance bodies, and support programs that preserve local cultural identity while enabling technological upgrading for global competitiveness (OECD, 2019). In essence, Industrial District Theory illustrates how the interplay between economic activity and social structures fosters localized development, creating an environment in which SMEs can thrive while contributing to long-term economic sustainability through resilience, skill preservation, and the retention of wealth within the community.

3. Role in Economic Sustainability

The role of SME clusters in fostering economic sustainability is well established in the literature, drawing on multiple theoretical perspectives that link collective enterprise activity to long-term economic, social, and environmental outcomes. From the standpoint of sustainable development theory**,** economic sustainability entails generating steady growth, creating inclusive employment, and preserving resources for future generations (Brundtland Commission, 1987). SME clusters contribute to this goal by enhancing productivity, supporting innovation, and embedding economic benefits within local communities. The Cluster Theory (Porter, 1998; 2000) explains that geographical concentration of interconnected firms enables productivity gains, rapid knowledge diffusion, and specialization, which in turn promote resilience and long-term competitiveness. The Industrial District Theory adds a social dimension, highlighting how trust, shared norms, and cooperative networks within localized economies help retain wealth locally, strengthen regional value chains, and cushion communities against external shocks (Becattini, 2004; Schmitz & Nadvi, 1999).

From a Resource-Based View (RBV) perspective, clusters allow SMEs to collectively access and develop valuable, rare, inimitable, and non-substitutable resources, such as skilled labor, specialized technology, and market intelligence (Barney, 1991; Maskell & Malmberg, 2007). This resource pooling reduces costs, increases operational efficiency, and supports environmentally sustainable practices such as shared waste treatment and renewable energy adoption (UNIDO, 2013). Similarly, **the** Knowledge Spillover Theory of Entrepreneurship (KSTE) emphasizes that spatial proximity within clusters encourages the transfer of tacit knowledge, stimulates innovation, and enables SMEs to adapt more quickly to changing regulatory, market, and environmental conditions (Audretsch & Feldman, 1996; Bell & Albu, 1999).

The integration of these theoretical perspectives underscores that SME clusters not only enhance short-term competitiveness but also provide a structural foundation for long-term sustainability. By enabling inclusive growth, they expand opportunities for marginalized groups and encourage skill development within the workforce (Nadvi & Barrientos, 2004; World Bank, 2020). Furthermore, clusters can align economic activities with environmental stewardship, for example, through joint adoption of cleaner production technologies, coordinated recycling systems, and collective certification for green products (OECD, 2019). The combined effect is a business ecosystem that is adaptable, resource-efficient, and socially inclusive, aligning with the triple bottom line principles of economic, social, and environmental sustainability. However, as McCormick (1999) cautions, realizing the full sustainability potential of clusters requires supportive governance, policy frameworks, and institutional coordination to ensure that competitive gains translate into enduring, broad-based development benefits.

3. Resource-Based View (RBV) and Shared Capabilities

The Resource-Based View (Barney, 1991) explains how firms achieve sustained competitive advantage through the possession of valuable, rare, inimitable, and non-substitutable (VRIN) resources. In the context of SME clusters, firms can pool resources, such as specialized skills, market intelligence, and infrastructure that might be unattainable individually (Maskell & Malmberg, 2007). This collective resource mobilization enhances operational efficiency, reduces production costs, and facilitates environmentally sustainable practices like shared waste management systems and renewable energy use (UNIDO, 2013).

4. Knowledge Spillover Theory of Entrepreneurship (KSTE)

The Knowledge Spillover Theory of Entrepreneurship suggests that spatial concentration of firms encourages knowledge diffusion, innovation, and entrepreneurial activity (Audretsch & Feldman, 1996). In SME clusters, informal interactions, supplier-buyer linkages, and collaborations with universities or research centers facilitate technology adoption and product diversification. Such innovation capacity enables SMEs to respond to environmental regulations, resource constraints, and market demands in a sustainable manner (Bell & Albu, 1999).

5. Sustainable Development Perspective

From the Sustainable Development framework (Brundtland Commission, 1987), economic sustainability involves meeting current needs without compromising future generations' ability to meet their own. SME clusters contribute to this by promoting inclusive economic

growth, reducing inequality through employment opportunities, and encouraging green production methods (World Bank, 2020). The proximity of actors in a cluster allows for coordinated initiatives such as energy efficiency programs, sustainable sourcing, and collective environmental certifications, which strengthen the triple bottom line economic, social, and environmental performance (OECD, 2019).

Hypothesis development

Role of SMEs cluster innovation on economic sustainability

Innovation emerging within SME clusters has a profound and positive influence on economic sustainability**,** as it enables firms to enhance competitiveness, adopt resource-efficient practices, and build long-term resilience. According **to** Cluster Theory, the geographical concentration of interconnected SMEs, suppliers, and institutions generates an environment of intense interaction, where competition and collaboration stimulate continuous innovation (Porter, 1998; 2000). Proximity allows knowledge to flow more easily between firms, research institutions, and workers, creating a dynamic ecosystem that accelerates the development of new products, services, and technologies (Maskell & Malmberg, 2007).

From the standpoint of economic sustainability**,** such innovation ensures steady productivity growth while simultaneously reducing costs and resource dependency. SMEs often lack the resources to innovate independently, but cluster settings allow them to share risks and costs through joint R&D initiatives, collective training programs, and technology-sharing platforms (Giuliani, Pietrobelli, & Rabellotti, 2005). As a result, clusters facilitate the adoption of environmentally friendly technologies, energy-efficient systems, and waste-reduction processes, aligning with the environmental dimension of sustainability (UNIDO, 2013).

Innovation within clusters also strengthens social and economic inclusion**.** By creating new products and services, clusters open opportunities for local employment, skill development, and entrepreneurial ventures, which enhance community welfare (Nadvi & Barrientos, 2004). Moreover, the cumulative effect of innovation-driven competitiveness fosters local reinvestment and economic diversification, reducing dependence on single markets and increasing resilience to global shocks (Schmitz & Nadvi, 1999). This adaptability is essential for maintaining long-term economic sustainability in an uncertain global economy. We thus hypothesize;

H1: SMEs cluster innovation has a positive impact on economic sustainability

The role of SMEs cluster knowledge spillover on Economic Sustainability

Knowledge spillover within clusters significantly contributes to economic sustainability by enhancing innovation capacity, accelerating technology adoption, and fostering long-term competitiveness among firms. The Knowledge Spillover Theory of Entrepreneurship (KSTE) emphasizes that the close geographical proximity of firms, suppliers, research institutions, and service providers facilitates the transfer of both tacit and explicit knowledge, often through informal networks, labor mobility, and collaborative projects (Audretsch & Feldman, 1996). In the context of Small and Medium Enterprises (SMEs)**,** this phenomenon is particularly important, as it allows resource-constrained firms to access advanced know-how, managerial expertise, and market intelligence without incurring prohibitive costs (Bell & Albu, 1999).

From an economic sustainability perspective, knowledge spillover

strengthens firms' ability to innovate continuously, adapt to shifting market demands, and comply with evolving environmental and regulatory standards (Porter, 1998; 2000). This capacity for innovation not only supports the competitiveness of individual firms but also ensures the resilience of the entire cluster ecosystem. For example, when one firm within a cluster adopts a cleaner production technology or develops a more efficient process, other firms can learn from and adapt these innovations, leading to widespread efficiency gains and reduced environmental footprints (UNIDO, 2013). Over time, this diffusion of sustainable practices helps maintain the cluster's competitiveness while aligning with the principles of the triple bottom line economic viability, social equity, and environmental stewardship (OECD, 2019).

Empirical studies of industrial districts, such as those in Northern Italy and Denmark, demonstrate that knowledge spillovers often lead to collective upgrading, where firms within a cluster simultaneously improve quality standards, diversify products, and adopt greener technologies (Becattini, 2004; Giuliani, Pietrobelli, & Rabellotti, 2005). This collective advancement strengthens local economies by increasing export capacity, creating high-value jobs, and attracting further investment. Additionally, the shared learning environment reduces duplication of effort, minimizes resource waste, and accelerates the commercialization of sustainable innovations.

Ultimately, cluster-based knowledge spillover fosters economic sustainability by embedding a culture of continuous improvement and adaptability within localized production systems. This embeddedness ensures that competitive advantages are difficult for external competitors to replicate, while the social and environmental benefits are retained within the community. When supported by effective governance, investment in education, and linkages with research institutions, knowledge spillovers within clusters can transform localized economies into resilient, sustainable growth hubs capable of withstanding global economic fluctuations and environmental challenges (McCormick, 1999). We thus hypothesize;

H2: SMEs cluster knowledge spillover has a positive impact on Economic Sustainability

The role of SMEs Cluster collaboration on Economic Sustainability

Collaboration among SMEs within clusters is a critical driver of economic sustainability**,** as it enhances resource efficiency, strengthens competitiveness, and promotes inclusive growth. According to Cluster Theory**,** collaboration among geographically proximate firms creates synergies that increase productivity, stimulate innovation, and reduce transaction costs (Porter, 1998; 2000). For SMEs, which often face limitations in finance, technology, and market access, cluster-based collaboration provides access to shared resources, infrastructure, and expertise that would otherwise be unattainable (Maskell & Malmberg, 2007). This collective efficiency, as defined by Schmitz (1995), allows SMEs to achieve greater outcomes together than individually, reinforcing long-term economic resilience.

From a sustainability perspective**,** collaboration enables SMEs to pool resources for environmentally friendly production systems, such as joint waste management, renewable energy initiatives, and eco-certification schemes (UNIDO, 2013). By working together, firms can spread the costs of adopting sustainable technologies and practices, making them more affordable for small businesses. This not only reduces the ecological footprint of production but also aligns clusters with

global sustainability standards, enhancing their competitiveness in international markets (OECD, 2019).

Socially, SME collaboration within clusters fosters inclusive development**,** as it encourages knowledge sharing, skill transfer, and collective training programs that benefit a wider labor pool (Becattini, 2004). Such collaboration strengthens local communities by providing stable employment, encouraging entrepreneurship, and embedding wealth within the region. Moreover, through joint marketing, branding, and lobbying efforts, SMEs in clusters gain access to new markets and financing opportunities, ensuring long-term viability and growth (Giuliani, Pietrobelli, & Rabellotti, 2005).

Empirical evidence from industrial districts in Europe, Asia, and Africa highlights that collaborative clusters are more resilient during economic crises, as firms support one another through subcontracting, information exchange, and shared strategies (Schmitz & Nadvi, 1999; McCormick, 1999). This resilience reflects the embeddedness of economic activity within local social structures, which enhances adaptability to global shocks.

Ultimately, SME cluster collaboration strengthens economic sustainability by creating a self-reinforcing ecosystem of cooperation and competition. It reduces costs, enhances innovation, promotes environmental responsibility, and ensures inclusive development, thereby aligning economic progress with the broader principles of sustainable development. When supported by effective governance and enabling policy frameworks, cluster-based collaboration has the potential to transform SME networks into engines of resilient, sustainable growth. We thus hypothesize;

H3: SMEs Cluster collaboration has a positive impact on Economic Sustainability

Role of SMEs Clusters collaboration on Economic Sustainability

Competitiveness within SME clusters plays a central role in promoting economic sustainability**,** as it drives innovation, enhances productivity, and ensures the long-term resilience of localized economies. According to Porter's Cluster Theory, competition among firms within a geographically concentrated cluster pushes enterprises to continuously improve efficiency, upgrade technology, and differentiate products, thereby creating a self-reinforcing cycle of innovation and competitiveness (Porter, 1998; 2000). Unlike isolated firms that may stagnate due to limited rivalry, SMEs within clusters are compelled to adapt to higher performance standards, which not only improves individual firm outcomes but also strengthens the competitiveness of the entire regional economy (Becattini, 2004).

From a sustainability perspective, competitiveness in clusters encourages SMEs to seek innovative solutions for resource efficiency and environmental responsibility. Firms under competitive pressure are more likely to adopt cleaner technologies, eco-friendly production processes, and energy-saving innovations as part of their differentiation strategies (Maskell & Malmberg, 2007). This aligns business survival with environmental stewardship, ensuring that long-term economic growth does not come at the expense of natural resource depletion or ecological degradation (UNIDO, 2013).

Moreover, cluster competitiveness fosters inclusive and sustained economic growth. SMEs striving for competitive advantage often invest in skill development, workforce training, and product upgrading, which contribute to local capacity building and human capital development (Schmitz & Nadvi, 1999). This localized growth

ensures that wealth and employment opportunities are distributed more evenly within communities, reinforcing the social dimension of sustainability (World Bank, 2020). Competitive SME clusters also attract investment and integrate more easily into global value chains, expanding export opportunities and ensuring long-term participation in international markets (Giuliani, Pietrobelli, & Rabellotti, 2005).

Empirical evidence shows that regions with highly competitive clusters, such as industrial districts in Northern Italy and technology clusters in East Asia, experience higher rates of innovation, firm survival, and economic resilience compared to non-clustered regions (McCormick, 1999). Competitive dynamics within these clusters not only generate immediate productivity gains but also embed sustainable practices that ensure adaptability to global economic shocks, such as financial crises or supply chain disruptions.

Ultimately, SME cluster competitiveness enhances economic sustainability by creating an environment where firms are incentivized to innovate, optimize resources, and integrate sustainable practices into their operations. Through rivalry and benchmarking, clusters maintain a culture of continuous improvement that benefits the entire ecosystem firms, workers, and communities alike. When supported by enabling institutions and policies, competitive SME clusters become engines of sustainable, resilient, and inclusive growth that can withstand both local and global challenges. We thus hypothesize;

H4: SMEs Clusters collaboration has a positive impact on Economic Sustainability

Methodology

Study context

The study was conducted in Tanzania using the two regions of Morogoro and Iringa, which are notable for cluster engagements and potential for industrial agglomeration. These areas have been recognized for their active SME communities and the support infrastructure provided by organizations like the Small Industries Development Organization (SIDO) (Mulas et al., 2017). The population of the study consisted of members of recognized clusters within these regions, identified through official records and the networks established by various cluster-supporting institutions. Given the challenges related to the availability of pre-existing databases for startups due to the fast-evolving nature of the sector, participants were identified with the assistance of champion connectors. According to Olomi et al. (2014), these connectors play a critical role in facilitating access to diverse stakeholder groups and enhancing the reliability of data collection by leveraging established networks.

Study Design

The study adopted a mixed-methods approach, integrating both qualitative and quantitative research designs. This choice reflects a growing consensus on the effectiveness of mixed methods in

providing a comprehensive understanding of complex social phenomena, especially in entrepreneurship contexts (Creswell & Creswell, 2018). Specifically, a case study design was utilized to explore the dynamics of incubators within the SME ecosystems while a survey methodology was adopted to gather quantitative data from startups due to the lack of reliable databases on SME participation within clusters. This two-pronged approach enables a nuanced exploration of how SME clusters can foster industrial development by combining detailed qualitative insights with broader quantitative patterns.

Data collection and sampling

Data collection was conducted in two phases. The first phase involved qualitative interviews aimed at exploring the innovations within Tanzania's SME ecosystem, focusing on key stakeholders involved in entrepreneurship labs and hubs. In-depth interviews were essential in extracting nuanced insights into the operational challenges and opportunities faced by SMEs, aligning with the exploratory sequential research design advocated by Myers and Oetzel (2003). The interviews helped identify key themes that informed the development of a standardized questionnaire, which was subsequently validated through a pilot test with a small sample of stakeholders. In the second phase, structured surveys utilizing tailored questionnaires were administered face-to-face to various SME representatives, ensuring that context-specific factors were considered. Data analysis encompassed both qualitative techniques using NVivo for thematic analysis and quantitative methods, employing SPSS and Excel for statistical analysis (Saunders et al., 2003). The reliability and validity of the findings were rigorously assessed through test-retest methods and correlation matrices, ensuring the credibility of results.

Measurements

The questionnaire was developed by adopting and modifying measurement scales from past studies related to SMEs and clusters. However, minor modifications were made to ensure the scales fit the context and methodological issues surrounding the current study. All variables were captured by using 5-point Likert scales from 1 (strongly agree) to 5 (strongly disagree) (Likert et al., 1934; Likert et al., 1993). Economic sustainability was measured by using five factors which were adopted from Falebita, Koul & Taylor (2024), Tong et al. (2023) and Lee (2009). Knowledge spillover was measured by two items which were adopted from Sölvell, Lindqvist & Ketels (2003), Dahl & Pedersen (2004) and Morrison (2009). Cluster innovation was measured by two factors which were adopted from Giuliani, Pietrobelli, & Rabellotti, (2005) and Morrison (2009). Cluster collaboration was measured by two factors which were adopted from

Schmitz, (1995) and Schmitz & Nadvi (1999). The table below provide the detailed information about measurements.

	ITEMS	SOURCE	Alpha	CR	AVE
ECOSUST	▪ Profit has grown because of clusterization ▪ There is an increase in investment due to clusterization ▪ The cluster have attracted the number of customers ▪ The players in our cluster are continually increasing ▪ Business activities are rapidly increasing in our cluster	Falebita, Koul & Taylor (2024) Tong et al. (2023) Lee (2009)	0.8	0.85	0.5
CKS	▪ Our enterprise has benefited from innovation support mechanisms (training,infrastructure) as provided within the cluster, ▪ Our enterprise has benefited fro knowledge sharing within the cluster	Sölvell, Lindqvist & Ketels (2003) Dahl & Pedersen (2004) Morrison (2009)	0.5	0.73	0.6
CLSI	▪ Our enterprise has improved its product features as a result of being part of the cluster, ▪ Our enterprise has implemented processes (production,delivery process ets) due to collaboration within the cluster	Giuliani, E., Pietrobelli, C., & Rabellotti, R. (2005) Morrison, A. (2009)	0.5	0.8	0.6
CC	▪ Our enterprise has adopted new technologies resulting from involvement in the cluster, ▪ Being part of the cluster has improved our enterprise access to the domestic and international markets, ▪ The cost effeciency of our enterprise has increased due to operating under our cluster	Bell, M., & Albu, M. (1999) Giuliani, E. (2005)	0.69	0.89	0.61
CCLB	▪ Our cluster is essential effective between our enterprise and other cluster members , ▪ Our cluster has the potential for partnership among enterprises	Schmitz, H. (1995) Schmitz, H., & Nadvi, K. (1999) Nadvi, K. (1999)	0.5	0.81	0.66

RESULTS AND DISCUSSION

Business Characteristics

The study examined various characteristics of small and medium-sized enterprises (SMEs) within clusters, focusing on business types, turnover, and registration status. The findings revealed that the predominant businesses within these clusters were food processing (34.8%) and clothing (30.3%), with lower representations in art and tourism (12.9%), grain (11.2%), and timber/furniture (10.7%). Most SMEs reported a turnover of up to 5 million, indicating that the majority are classified as micro and small enterprises (94.9%), while only 5.1% reported a turnover above this threshold. Additionally, the study found that 84.8% of the respondents had formally registered their businesses, while 15.2% operated informally.

Table 1: Business Characteristics

Kind of business	Category	Frequency	Percent
	Food processing	62	34.8
	Timber cluster(furniture)	19	10.7
	Grain Cluster	20	11.2
	Clothing cluster	54	30.3
	Art and tourism Cluster	23	12.9
What is your general turnover?			
	Up to 5 million	169	94.9
	Above 5 million	9	5.1
Is your business registered?	YES	151	84.8
	NO	27	15.2

In order to test the hypotheses (H1-H4), Ordinary least square was estimated. The regression results are shown in the table below.

Descriptive statistics

Assessment of the measurements

The table below indicates that factor loadings were>0.3, indicating good convergent validity, and the value of the Cronbach Alpha Coefficient (α) for all variables was>0.5, which implies good internal reliability and consistency of the construct (Kline, 2005; Tabachnick and Fibell, 2007; Pallant, 2000). The composite reliability (CR) is>0.6 for all variables, and hence the instruments were reliable (Reynaldo and Santos, 1999; Tavakol and Dennick, 2011). The average variance extracted (AVE) is>0.5 for all variables, indicating convergent validity in the data (Bagozzi and Yi, 1988). Similarly, as presented in the correlation table , the value of the square root of AVE was greater than the correlations between the factor and other factors, and therefore discriminant validity was achieved. Overall, this means that each variable is much more related to its own measures than other variables (Fornell and Larcker, 1981).

Table: Measurement Model Analysis

VARIABLE	ITEMS	LOADINGS	ALPHA	CR	AVE
ECOSUST	▪ Profit has grown because of clusterization	0.64	0.8	0.85	0.5
	▪ There is an increase in investment due to clusterization	0.71			
	▪				

	▪ The cluster have attracted the number of customers ▪	0.71			
	▪ The players in our cluster are continually increasing ▪	0.73			
	▪ Business activities are rapidly increasing in our cluster	0.73			
CKS	▪ Our enterprise has benefited from innovation support mechanisms (training,infrastructure) as provided within the cluster,	0.78	0.5	0.73	0.6
	▪ Our enterprise has benefited from knowledge sharing within the cluster	0.63			
CLSI	▪ Our enterprise has improved its product features as a result of being part of the cluster,	0.86	0.5	0.8	0.6
	▪ Our enterprise has implemented processes (production,delivery process ets) due to collaboration within the cluster	0.72			
CC	▪ Our enterprise has adopted new technologies resulting from involvement in the cluster,	0.85	0.69	0.89	0.61

	▪ Being part of the cluster has improved our enterprise access to the domestic and international markets, ▪	0.81			
	▪ The cost effeciency of our enterprise has increased due to operating under our cluster	0.69			
CCLB	▪ Our cluster is essential effective between our enterprise and other cluster members,	0.73	0.5	0.81	0.66
	▪ Our cluster has the potential for partnership among enterprises	0.72			

Table: Correlation Matrix

	1	2	3	4	5
1. ECOSUST	**0.71**				
2. CKS	.321**	**0.77**			
3. CLSI	.552**	.108	**0.77**		
4. CC	.694**	.247**	.532**	**0.78**	
5. CCLB	.070	.086	-.062	.101	**0.81**
MEAN	4.05	4.22	4.10	3.81	4.17
SD	0.50	0.46	0.49	0.66	0.99

** Corellation is significant at the 0.01 level (2-tailed)

N=240 Diagonal elements in bold are the square roots of the average variance extracted for constructs measured reflectively with multiple items

Note: bolded diagonal parameters are the square root of AVE

Common method bias

To avoid the presence of common method bias, a variety of approaches were used. Furthermore, statistical measures and remedies suggested by (Podasakoff et al., 2003) were adopted to reduce the probability of the existence of common

method bias in the study. (Podsakoff et al., 2003) suggested the use of Harman's single-factor technique, where all items, i.e., latent variables being measured, are put into a single common factor. In general, CMB has no effect on data if the overall variance for a single factor is less than 50%. According to the study's findings, the first unrotated component accounted for only 47.4 percent of the total variance. Based on these results, the common technique bias was not a concern in the current study.

Results and Discussion

Linear regression was used to test the conceptual model focusing on the variables which were used. The results presented in the table below provide regression results for the four hypothesis. The general regression model was relatively a good predictor for the dependent variable (Economic sustainability) (R2Adj = 0.51, F (174, 4) =46.1, p < 0.001). In addition to an independent sample t-test and z-test for regression coefficient to confirm whether there was a significant difference.

To test for multicollinearity, VIF values were calculated and were in the range of 1.37–2.4, suggesting that the study does not suffer from multicollinearity problems (Hair et al., 2012). Generally, the dependent variable is different for the two countries but the conclusions

Table: Regression Results

Independent Variables	B	T
Const	.58	1.68*
Cluster Innovation (CLSI)	.25	3.76**
Cluster knowledge spillover (CKS)	.20	2.98**
Cluster collaboration (CCLB)	.09	2.84**
Cluster competitiveness (CC)	.31	5.86**
	R^2 Adj= .51 F (4, 174)=46.1 P<.001	

Table: Collinearity test

VARIABLES	Collinearity Statistics	
	Tolerance	VIF
Cluster Collaboration (CCLB)	.702	1.425
Cluster Innovation (CLSI)	.769	1.300
Cluster Knowledge Spillover (CKS)	.898	1.113
Cluster Competitiveness (CC)	.589	1.697

Hypothesis 1 suggested a positive impact of SMEs cluster innovation on Economic Sustainability. Table above show Cluster innovation has a positive and statistically significant impact on economic sustainability (b=0.25, t=3.76, p<0.001). This indicates that innovative activities within SMEs clusters substantially enhance sustainable economic outcomes.

Hypothesis 2 suggested SMEs cluster knowledge spillover has an impact on economic sustainability. The findings show that Knowledge spillovers within clusters also show a positive and significant effect on economic sustainability (b=0.20, t=2.98, p<0.01). This suggests that shared learning and diffusion of knowledge among SMEs foster long-term economic resilience and growth.

Hypothesis 3 suggested that SMEs Cluster Collaboration has a positive impact on economic sustainability. The findings show that Cluster collaboration significantly influences economic sustainability (b=0.09, t=2.84, p<0.01). When SMEs work together through joint initiatives, shared resources, or partnerships, they contribute positively to sustainable economic performance.

Hypothesis 4 suggested that SMEs cluster competitiveness has a positive impact on economic sustainability. The findings revealed SMEs Cluster competitiveness emerged as the strongest predictor of economic sustainability (b=0.3, t=5.86, p<0.001). Competitive pressures within clusters drive SMEs to improve efficiency, adopt sustainable practices, and remain resilient in the long term.

The positive impact on SMEs cluster innovation on Economic sustainability is consistent with Porter's Cluster Theory (Porter, 1998; 2000) and the Knowledge Spillover Theory of Entrepreneurship (KSTE) (Audretsch & Feldman, 1996). Innovation in clusters emerges from the dense interactions between firms, suppliers, and supporting institutions, fostering rapid product and process upgrades. This finding reinforces prior research showing that industrial districts and technology clusters often outperform isolated firms in terms of productivity and adaptability (Becattini, 2004; Giuliani, Pietrobelli, & Rabellotti, 2005). The implication is that SME clusters generate innovations that not only enhance firm competitiveness but also contribute to sustainable practices, such as eco-friendly production methods and resource-efficient technologies (UNIDO, 2013). Hence, innovation acts as a key channel through which clusters sustain economic growth while aligning with environmental and social objectives.

The positive impact of Knowledge Spillover on Economic Sustainability is consistent with previous perspectives (Bell & Albu, 1999; Maskell & Malmberg, 2007). Relationship between knowledge spillovers to economic sustainability highlights the vital role of learning and diffusion processes within clusters. The findings suggest that firms in clusters benefit from both formal collaborations and informal exchanges of tacit knowledge, leading to collective upgrading and technological advancement (Bell & Albu, 1999; Maskell & Malmberg, 2007). This outcome supports Schmitz and Nadvi's (1999) concept of collective efficiency, where inter-firm learning raises the performance threshold of the entire cluster. Importantly, the positive effect on sustainability underscores that knowledge spillovers reduce the cost and risk of adopting environmentally responsible practices by allowing SMEs to learn from early adopters. This accelerates the diffusion of sustainable technologies, strengthens competitiveness, and improves the overall resilience of local economies (OECD, 2019).

The positive impact of SMEs Collaboration on Economic Sustainability and was

validated by the research findings and is consistent with research that emphasizes the role of joint action in achieving collective efficiency (Schmitz, 1995). Collaboration enables SMEs to share resources, pool risks, and jointly access new markets, thereby overcoming size-related constraints (McCormick, 1999). From a sustainability perspective, collaboration extends beyond business efficiency to include environmental and social outcomes. For instance, SMEs working together on joint waste management systems, renewable energy initiatives, or collective certification programs achieve economies of scale in sustainability investments (UNIDO, 2013). Furthermore, collaboration enhances social sustainability by facilitating knowledge-sharing, collective training, and workforce development, which broaden opportunities for local communities (Nadvi & Barrientos, 2004). Thus, collaborative practices reinforce inclusivity and ensure that the benefits of growth are widely distributed**.**

The positive impact of SMEs Competitiveness on Economic Sustainability aligns with empirical evidence showing that competitive industrial districts maintain high levels of innovation and resilience in global markets (Becattini, 2004; Giuliani et al., 2005). Competitive pressures within clusters push firms to continuously improve quality, reduce costs, and differentiate products, which not only benefits individual enterprises but also strengthens the sustainability of the cluster as a whole (Porter, 1998). More importantly, the positive relationship with sustainability indicates that competition encourages SMEs to pursue cleaner technologies, greener products, and more efficient processes as strategies for differentiation (Maskell & Malmberg, 2007). In this way, competitiveness fosters sustainable practices that secure long-term economic viability while reducing environmental impacts.

Conclusion

This study examined the relationship between SME cluster dynamics innovation, knowledge spillovers, collaboration, and competitiveness and their impact on economic sustainability**.** The findings supported all four hypotheses, confirming that each dimension exerts a positive influence on sustainable economic outcomes.

The results show that cluster innovation enhances productivity, fosters eco-friendly technologies, and strengthens adaptability to global market changes. Knowledge spillovers facilitate collective upgrading, accelerate the diffusion of sustainable practices, and reduce adoption costs for SMEs. Collaboration within clusters allows resource pooling, joint sustainability initiatives, and inclusive economic opportunities. Finally, competitiveness promotes continuous improvement, drives differentiation strategies, and encourages greener practices as firms seek long-term survival advantages. Together, these mechanisms demonstrate that SME clusters act as dynamic ecosystems where cooperation, rivalry, and learning interact to generate outcomes that align with the triple bottom line of economic viability, social inclusion, and environmental stewardship.

Study Limitation

While this study provides valuable insights into how SME clusters drive economic sustainability in Tanzania, several limitations should be acknowledged. First, the research was limited to a sample of 178 respondents, which, although adequate for statistical analysis, may not fully capture the diversity of SME clusters across different sectors and regions of Tanzania. Second, the use of a cross-sectional design restricts the ability to establish long-term causal relationships; the findings indicate

associations rather than definitive cause-and-effect dynamics. Third, the reliance on self-reported data may introduce response bias, as participants could overstate or understate the benefits of cluster participation due to social desirability or subjective perceptions. Fourth, while the mixed methods approach enhanced validity, the qualitative component was restricted to selected clusters**,** potentially limiting the generalizability of contextual insights. Lastly, the study focused primarily on four cluster dimensions innovation, knowledge spillovers, collaboration, and competitiveness without accounting for other external factors such as policy environment, access to finance, or global market shocks, which may also influence economic sustainability.

Theoretical Implications

The study contributes to the body of knowledge on cluster theory and sustainability by integrating multiple theoretical perspectives—Cluster Theory (Porter, 1998), Industrial District Theory (Becattini, 2004), the Resource-Based View (Barney, 1991), and the Knowledge Spillover Theory of Entrepreneurship (Audretsch & Feldman, 1996) into a unified framework. By demonstrating that innovation, spillovers, collaboration, and competitiveness collectively support economic sustainability, the findings reinforce the mutually reinforcing nature of these mechanisms within clusters. The results also extend the literature on collective efficiency (Schmitz & Nadvi, 1999), confirming that localized dynamics can lead not only to competitiveness but also to broader sustainable development outcomes.

Practical Implications

For policymakers, the study highlights the importance of cluster-based development strategies as a pathway to sustainability. Interventions should focus on strengthening SME networks, providing shared infrastructure, and incentivizing green innovation through subsidies or collaborative R&D platforms. For SMEs, the results emphasize the need to actively participate in cluster activities leveraging spillovers, engaging in joint initiatives, and competing through sustainable practices rather than solely through cost reduction. Development agencies and business associations can play a facilitative role by creating cluster governance structures**,** training platforms, and sustainability-focused certifications that amplify the benefits of collaboration and competitiveness.

Implications for Future Research

While this study confirms the positive impacts of SME cluster dynamics on economic sustainability, further research is needed to examine sector-specific and regional variations**.** Comparative studies could explore how the relative importance of innovation, spillovers, collaboration, and competitiveness differs across manufacturing, services, and high-tech industries. Longitudinal research could provide insights into how clusters evolve over time and whether sustainability outcomes persist in the long run. Moreover, future studies should incorporate environmental and social performance metrics alongside economic indicators to provide a more comprehensive evaluation of cluster contributions to the triple bottom line**.** Finally, there is scope to investigate the role of digitalization and Industry 4.0 technologies in shaping new forms of knowledge spillovers, collaboration, and competitiveness within SME clusters.

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