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Influence of Value Networks on Operational Efficiency in Smallholder Farming: A Systematic Literature Review

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ABSTRACT

Smallholder farming contributes significantly to rural livelihoods and the national economy, yet farmers face challenges, such as limited market access, inadequate farming inputs, and fragmented stakeholder coordination that hinder their operational performance. These barriers prevent smallholder farmers from achieving optimal productivity and profitability. The purpose of the study was to examine the impact of value networks on the operational performance in smallholder farming, using a systematic literature review and drawing on stakeholder and network theories. The study explored how well-structured value networks could enhance the efficiency, resource flows, and market responsiveness of smallholder farmers. Eight-eight documents were extracted from academic databases and analysed using systematic literature review. The results of the study indicate that well-structured value networks can enhance operational performance of smallholder farmers by improving their coordination, resource exchanges, and market responsiveness. The study found that strong relationships within value networks enhance communication and reduce delays, thus providing smallholder farmers with better access to resources. It was further noted that timely access to inputs like seeds and fertilisers reduces bottlenecks and enhances productivity among smallholder farmers. This research contributes theoretically by proposing a value network framework applicable to smallholder farming. The framework emphasizes strategies for addressing the challenges faced by smallholder farmers, such as fragmented markets and limited access to technology. This study does not rely

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on specific data from smallholder farming but generalizes findings to smallholder farming contexts across similar agricultural settings. Therefore, future research should validate the framework in real-world settings and explore the role of social and environmental factors in enhancing the effectiveness of value networks.

Keywords: Value Networks; Operational Performance; Smallholder Farming; Supply Chain and Agricultural Efficiency

1. Introduction

According to the International Fund for Agricultural Development[1], smallholder farms represent over 90% of the world's farms and produce roughly 80% of the food consumed in the developing world, particularly in Asia. In Latin America and the Caribbean, smallholder farmers account for 56% of agricultural employment and about 30–40% of total agricultural production[2]. In Africa, about 80% of farms are considered smallholdings, typically less than 2 hectares in size[3]. These farmers contribute approximately 70% of the continent's food supply, making them essential to both local food security and agricultural output[4]. In sub-Saharan Africa, the agricultural sector employs 60% of the population, with women playing a critical role in food production. In Kenya, smallholder farmers contribute over 75% of the country's agricultural output. In Zimbabwe, agriculture is a cornerstone of the economy, contributing significantly to employment, livelihoods, and food security. The sector accounts for approximately 17% of the country's GDP and remains a key source of exports[5]. Smallholder farming is particularly crucial, representing about 70% of agricultural production and providing employment for over 60% of the rural population[6]. This sector produces a wide range of crops, including maize, tobacco, and cotton, vital for subsistence and commercial agriculture. While maize is central to food security, tobacco is one of the country's largest export earners. Other crops, like cotton and sugarcane, play crucial roles in rural livelihoods and manufacturing. Nonetheless, smallholder farming is undermined by a plethora of supply chain challenges.

Several studies have explored the challenges faced by smallholder farmers, focusing on various aspects of agricultural production and market participation. Mango et al.[7] examined the determinants of food security among smallholder farmers, identifying critical challenges such as poor soil fertility, limited access to agricultural inputs, and the adverse impacts of climate change.[8] further investigated the factors influencing smallholder farmers' decisions to participate in soybean markets. Their study highlighted additional challenges, including a lack of market information, limited access to credit facilities, and inadequate infrastructure. These barriers restrict smallholder farmers' market integration and limit their potential for income generation. Zamasiya et al.[9] focused on crop production constraints faced by smallholder farmers. They identified key issues such as limited access to critical resources, the variability of climatic conditions, and inadequate extension services. These constraints exacerbate production inefficiencies and limit the ability of smallholder farmers to adapt to changing agricultural environments. To address these challenges, the adoption of a value network framework offers a promising solution for improving the operational efficiency of smallholder farmers.

Value networks (VNs) offer a framework for understanding complex relationships and interactions among stakeholders involved in smallholder farming. VNs encompass the roles of various actors, such as farmers, suppliers, traders, and government agencies like extension workers in creating value within the agricultural sector[10]. This framework focuses on optimizing resource flows, enhancing communication, and fostering market responsiveness, which are critical for addressing the fragmented nature of smallholder farming systems. Understanding how VNs function and influence the OP of smallholder farmers is critical for improving efficiency and sustainability. Existing VN studies, such as those by Teece[11] and Adner and Kapoor[12], heavily focus on innovation and advanced technological integration. However, these models may not align with the realities of smallholder farmers, who often rely on tradi-

tional methods and face significant barriers to technological access. Though studies like Hämäläinen and Heiskanen's[13] and Keranen, Makkonen and Tinnilä's[14] discuss sustainability within VNs, they often focus on larger-scale industries and technological innovations. Most VN research emphasizes global networks or large markets, such as Srivastava, Shervani and Fahey's[15] and Santos et al.'s[16], with little attention to the specific consumer preferences and market dynamics within local farming communities. While numerous studies examine VNs in high-tech industries[17], global export markets[18], and large-scale farming systems[19], there is a notable lack of research addressing how VNs operate in smallholder farming, particularly in Zimbabwe. There is no value network framework specifically tailored to smallholder farming. This study aims to address that gap by conducting a systematic literature review to analyse the effect of VNs on the OP in smallholder farming, laying the groundwork for future research. While this study references the agricultural sector as a backdrop, it generalizes findings to smallholder farming in resource-constrained contexts due to the lack of case-specific data. The study seeks to address the following research objectives:

1. To determine how key actors and their specific roles, the nature of their relationships, and the exchange of resources affect the operational performance of smallholder farming within resource-constrained countries.
2. To evaluate how specific supply chain activities, support mechanisms, and competencies influence the operational performance of smallholder farming within resource-constrained countries.
3. To analyse how value creation and market orientation contribute to improving the operational performance of smallholder farming within resource-constrained countries.
4. To propose a value network model that can be used by smallholder farmers to improve their operational performance within resource-constrained countries.

The rest of the paper is structured as follows: Section 2 presents the theories on which the study is based. Section 3 provides the methodology and meta-analysis used, followed by the literature of the study. Subsequent sections cover discussion and conclusions, along with theoretical and practical implications, limitations, and directions for future research. The next section presents the theoretical framework underpinning this study.

2. Theories Grounding the Study

The adoption of stakeholder theory and network theory is essential for understanding the dynamics of value networks (VNs) and their impact on the operational performance (OP) of smallholder farmers in Africa. Freeman, Phillips and Sisodia[20] highlighted that stakeholder theory recognises the diverse actors involved in smallholder farming, such as farmers, suppliers, customers, and government bodies. It ensures that the study accounts for the social, economic, and environmental factors affecting smallholder farming. Stakeholder theory underlined the importance of fostering inclusive decision-making processes that prioritise the needs and contributions of all stakeholders, leading to more sustainable and equitable farming practices[21]. Network theory complements stakeholder theory by focusing on the structural relationships between these stakeholders. Kramer, Bitsch and Hanf[22] explained how network theory allows the study to map the complex interactions within the agricultural supply chain, identifying key nodes (e.g., major suppliers and buyers) and links (e.g., partnerships, resource flows) that influence operational performance. In smallholder farming, where fragmented markets and limited coordination often hamper productivity, network theory provides a framework for understanding how improved alignment and collaboration between stakeholders can enhance efficiency and resource optimisation[23]. This theory is vital for identifying critical points in the network where targeted interventions can have the greatest impact on improving OP. Together, these theories offer a comprehensive approach to addressing the unique challenges faced by smallholder farmers around the world. Stakeholder theory ensures balanced consideration of all actors involved, while network theory optimises the relationships that sustain value networks. This dual approach is particularly valuable for developing a VN framework tailored to smallholder farmers in Africa, aligning both social and operational objectives to im-

prove performance. The next section presents the research methodology of this study.

3. Methodology and Meta-Analysis

This study followed the PRISMA guidelines for conducting a systematic literature review (SLR) to examine the influence of value networks (VNs) on the operational performance (OP) in smallholder farming. The SLR process was divided into several distinct phases, including planning, article identification, screening, eligibility, and synthesis, with the aim of ensuring a comprehensive and unbiased review of relevant literature. In the systematic review planning stage, the scope and objectives of the research were clearly defined. The guiding research questions focused on how VNs affect the OP of smallholder farmers, and which elements of VNs are critical for improving efficiency, resource utilisation, and market alignment. Based on these objectives, the review aimed to cover studies related to VNs, smallholder farming, OP, and agricultural supply chains, particularly in sub-Saharan Africa. A comprehensive search strategy was developed to capture the relevant studies from multiple academic databases, including Scopus, Web of Science, ProQuest, and CrossRef. The search terms were carefully constructed to target specific intersections relevant to the research questions, such as "Value networks AND operational performance," "Smallholder farming AND agricultural value chains," and "Operational outcomes AND value networks." This search spanned publications from 1st January 2001 to August 2024, ensuring the inclusion of both historical and recent literature. Only English-language articles were considered for inclusion. During the identification of studies phase, the initial search yielded 231 articles. These articles were screened based on their titles and abstracts to determine their relevance to the research objectives, with articles that did not focus on smallholder farming, VNs, or OP excluded from further consideration. A rigorous screening and eligibility process was applied to refine the list of articles for full-text review. After applying these criteria, 88 articles were selected for full-text review. The selection process was carried out independently by two researchers to ensure consistency and minimise bias. In the critical evaluation of the study phase, the full-text articles were thoroughly assessed for their relevance, methodology, and strength of evidence. The evaluation criteria included research design, with preference given to empirical studies with clear methodologies, sample size, and context, with studies offering robust sample sizes or detailed case studies in relevant contexts prioritised. Only studies with well-defined findings related to the impact of VNs on OP were included. Discrepancies in the evaluation were resolved through discussion and consensus among the researchers. The main themes that emerged from the review included the role of actors and relationships in enhancing coordination and resource flows, the influence of market linkages on operational efficiency, and the impact of collaborative activities on process improvement and market responsiveness. These themes were then synthesised into a conceptual framework that explains the relationship between VNs and OP in smallholder farming. The systematic literature review process is illustrated using a PRISMA flowchart (**Figure 1**), which outlines the stages of identification, screening, eligibility, and inclusion of studies.

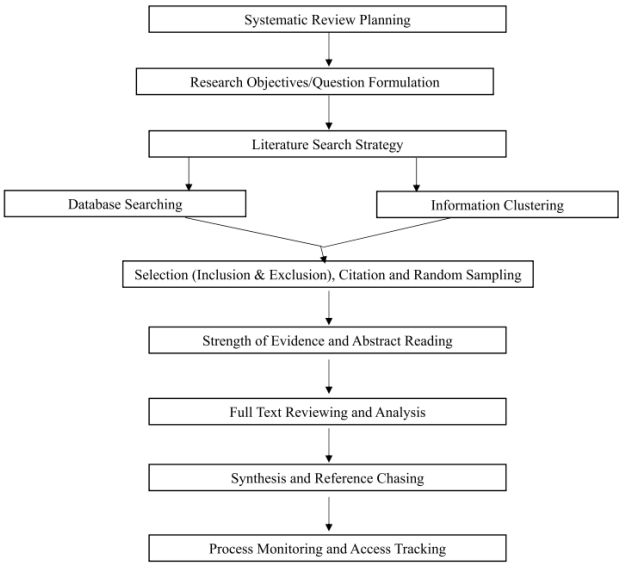

Figure 1. PRISMA flow chart.

This study did not include empirical data from smallholder farmers but instead draws on a systematic literature review to generalize findings to smallholder farming contexts globally. The next section presents the research methodology of this study.

3.1. Value Networks

The goal of this section is to provide an overview of previous studies that have applied to value networks (VNs) in different industries. The discussion that follows is a scrutiny of several authors' perspectives. Conway, Jones and Steward [24] emphasised four key components of VNs: actors, links, flows, and mechanisms. The study highlights the importance of many-to-many relationships in networks over dyadic ones, stressing collaborative relationships built on trust and mutual commitment among actors. The focus is on how these networks enhance value creation through interconnectedness and shared goals. Peppard and Rylander [25] discuss nodes and links as fundamental components of a VN, distinguishing it from traditional supply chains by the autonomy of networked organisations. The study explores how these links represent relationships and resources that facilitate the exchange of money, products, and information among network players. Allee [26] expands the elements of a VN to include roles, transactions, resource exchanges, and deliverables. The study emphasises the active participation of various entities ranging from individuals to nation-states who contribute and perform activities within the network, focusing on both tangible and intangible asset exchanges. Helander and Kukko [27] introduce four unique dimensions of VNs: actors, activities, resources, and consumer value. The study details how organisations coordinate actions and share knowledge within business networks to leverage their core competencies and enhance market offerings which illustrate the shift towards collaborative business environments. Adner and Kapoor [12] explore value creation in ecosystems rather than isolated firms which emphasise the role of platforms and network effects in fostering innovation and competitive advantage. The study discusses how actors within ecosystems collaborate and compete to create and capture value through interconnected relationships.

Hämäläinen and Heiskanen [13] examine value networks (VNs) in the context of transitioning towards sustainable practices. The study discusses how actors in these networks collaborate to develop and diffuse sustainable innovations. Hämäläinen and Heiskanen [13] emphasise the role of consumer preferences and regulatory frameworks in shaping network dynamics. Torugsa, O'Donohue and Hecker [28] examine how SMEs collaborate within networks to enhance innovation capabilities and competitiveness. The study discusses the role of network structures, interactions, and knowledge exchanges in facilitating innovation and value creation. Shang and Qi [29] examine how actors in these networks collaborate to optimise supply chain efficiency, manage risks, and enhance value through coordinated efforts in production, distribution, and logistics. Al-Debei [30] proposed seven dimensions of a VN, including network modes, actors, roles, interactions, communication flows, channels, and governance structures. The study discusses how different governance modes—hierarchical or flat—affect the dynamics of the network and influence the outcomes of interactions and value creation among network participants. Grudinschi [31] examines how VNs create value through collaborative efforts, averaging the assets and strengths of each partner. The study highlights the importance of roles and reciprocal engagement in solving challenges and creating value within complex networked environments. Srivastava, Shervani and Fahey [15] discussed how actors such as mobile operators, app developers, and users interact to create and deliver value through mobile services, thus focusing on network modes, roles, and governance as critical elements. Makkonen [32] discusses how actors collaborate across sectors to innovate and create new service offerings which highlight the importance of network relationships, resource exchanges, and governance mechanisms in fostering service innovation.

Dentoni and Krussmann [33] emphasise how value is co-created through interactions between actors and the potential for institutional entrepreneurship. The study explores how actors in the legume systems in Malawi recombine resources to address institutional and policy constraints and create value. Hagen et al. [34] analyse how actors, such as automakers, battery manufacturers, and charging infrastructure providers collaborate to develop EV ecosystems which emphasise the role of partnerships and technological integration in shaping network dynamics. Teece [11] explores how firms organise and leverage their resources to innovate and compete in dynamic environments. The study emphasises the

role of strategic agility, learning processes, and ecosystem partnerships in sustaining competitive advantage and value creation over time.

Patrício [35] argues for value co-creation through many-to-many interactions in complex business environments. The study discusses the balance needed in VNs to avoid value co-destruction and emphasises the importance of interactions that benefit multiple actors in achieving balanced outcomes. Galle and Matti [36] use VN mapping as a tool to unlock pathways for co-creation and reflexive monitoring in housing within the circular economy. The study highlights how different actors collaborate to create economic growth through value creation systems rather than individual economic actors. Santos et al. [16] explored strategies for countries to enhance their participation in global aerospace VNs. The study discusses network dynamics, governance, and structure, emphasising the impact of these factors on a country's global export share and industrial development policies.

Wang, Jin and Shang [37] examine how various stakeholders, including government agencies, technology providers, and citizens, collaborate to deploy smart city solutions that enhance urban living and sustainability. The study discusses the integration of IoT, data analytics, and infrastructure management in creating value within smart city ecosystems. Keranen, Makkonen and Tinnilä [14] examine how sustainable innovations in food packaging can be diffused through VNs. The study underlined the interdependence of actors, resources, activities, and relationships as critical components driving innovation and change within these networks. Komorowski et al. [38] employ a quadruple helix model to understand how creative networks foster sustainability. The study highlights the collaborative creation and delivery of value across companies and their suppliers, emphasising the role of these networks in local economic ecosystems. Dawson and Danielsson [39] investigate VNs in the context of digital platforms and ecosystems. The study discusses how platform owners, developers, and users interact to co-create value through digital services and applications. The study emphasises the role of network effects, data governance, and platform openness in shaping value creation dynamics. Galle et al. [40] focus on VN mapping to unravel system relations and activities. The study emphasises understanding roles, relationships, and value exchanges among organisations and stakeholders to ensure mutual value creation and effective network management.

The goal of this section was to determine whether prior research has explored the use of value networks (VNs) and if so, to summarise the findings and establish the originality of such studies. **Table 1** provides a summary of the elements of VNs as identified by each study.

Table 1. A summary of studies on value networks.

Authors	Elements of Value Networks
Conway, Jones and Steward [24]	Actors, links, flows, mechanisms, collaborative relationships, trust and mutual commitment
Peppard and Rylander [25]	Nodes, links, relationships, resources, exchange of money, products, and information
Allee [26]	Roles, transactions, resource exchanges, deliverables, tangible and intangible asset exchanges.
Helander and Kukko [27]	Actors, activities, resources, consumer value, coordinated actions, knowledge sharing, and core competencies.
Adner and Kapoor [12]	Platforms, network effects, innovation, competitive advantage, collaboration and competition.
Hämäläinen and Heiskanen [13]	Collaboration, sustainable innovations, consumer preferences and regulatory frameworks.
Torugsa, O'Donohue and Hecker [28]	Network structures, interactions, knowledge exchanges, innovation capabilities and competitiveness.
Shang and Qi [29]	Collaboration, supply chain efficiency, risk management, production, distribution and logistics.

Table 1. *Cont.*

Authors	Elements of Value Networks
Al-Debei [30]	Network modes, actors, roles, interactions, communication flow, channels, governance, hierarchical or flat governance.
Grudinschi [31]	Collaborative efforts, roles, reciprocal engagement, asset and strength averaging.
Srivastava, Shervani and Fahey [15]	Network modes, roles, governance, mobile operators, app developers and users.
Makkonen [32]	Collaboration, innovation, service offerings, network relationships, resource exchanges and governance mechanisms.
Dentoni and Krussmann [33]	Value co-creation, interactions, institutional entrepreneurship, resource recombination, institutional and policy constraints.
Teece [11]	Collaboration, partnerships, technological integration, auto makers, battery manufacturers and charging infrastructure providers.
Hagen et al. [34]	Resource organisation, innovation, strategic agility, learning processes, ecosystem partnerships and competitive advantage.
Patrício [35]	Value co-creation, many-to-many interactions, balanced outcomes and value co-destruction avoidance.
Galle and Matti [36]	Value network mapping, co-creation, reflexive monitoring, housing, circular economy, economic growth and value creation systems.
Santos et al. [16]	Network dynamics, governance, structure, global export share and industrial development policies
Wang, Jin and Shang [37]	Stakeholder collaboration, smart city solutions, urban living, sustainability, IoT, data analytics and infrastructure management
Keranen, Makkonen and Tinnilä [14]	Sustainable innovations, food packaging, interdependence of actors, resources, activities and relationships.
Komorowski et al. [38]	Quadruple helix model, creative networks, sustainability, collaborative value creation, delivery across companies and suppliers and local economic ecosystems.
Dawson and Danielsson [39]	Digital platforms, ecosystems, platform owners, developers, users, value co-creation, digital services, network effects, data governance, platform openness and value creation dynamics.
Galle et al. [40]	Value network mapping, system relations, activities, roles, relationships, value exchanges, mutual value creation and effective network management.

Source: Author (2024).

As shown in **Table 1**, the elements that constitute a value network (VN) vary somewhat across different studies, but there are several commonalities that can be synthesised into a coherent framework. This makes it very difficult to establish which VN model should be adopted in smallholder farming. To develop the framework for value network (VN) with distinctive elements from **Table 1**, the study followed a systematic approach to identify and synthesise unique elements mentioned by each study. First, the study reviewed each document to extract relevant elements, identifying unique terms and concepts introduced by each author. Next, the study grouped similar elements to avoid redundancy, combining related elements into broader categories to cover various aspects of VNs. For instance, terms like "actors," "nodes," and "roles" were grouped under "actors and roles," while elements like "transactions," "resource exchanges," and "flows" were synthesised into "flows and exchanges." Ensuring each category added a unique aspect or perspective on VNs, the study checked for overlapping and refined the categories to maintain distinctiveness. By synthesising network dynamics, governance, sustainability, innovation, consumer focus, and technological integration, the study created a cohesive framework that incorporates distinctive elements from each study. This structured approach ensures comprehensive coverage of the concept of VNs, organising the information effectively and capturing the essence of each contribution of the study. **Table 2** provides a comprehensive framework with distinctive elements from the various studies summarised in **Table 1** for understanding and analysing VNs.

The study proposed to develop a value network framework to be used in the smallholder farming. **Table 3** is organised, with each element of VN listed along with its inclusion/exclusion status and the reasoning behind that decision. This format ensures transparency and helps researchers and practitioners understand which aspects of VNs are most relevant in the specific context of smallholder farming.

Table 2. Key elements of a networked business model.

Elements	Description
Actors and roles	Participants in the network and their specific functions or positions.
Links and relationships	Connections and the nature of interactions between actors.
Flows and exchanges	Movement of resources, information, money, and products; specific transactions.
Activities and mechanisms	Actions performed to create value; processes and structures enabling activities.
Resources and competencies	Assets and core capabilities utilised by actors.
Value creation and co-creation	Processes of generating value; collaborative efforts to produce value.
Network dynamics and governance	Evolving interaction patterns; rules and structures guiding network operations.
Sustainability and innovation	Long-term viability and environmental impact; development of new ideas and products.
Consumer and market focus	Benefits derived by consumers; strategies responding to market demands and competitive pressures.
Technological integration and platforms	Incorporation of technology; infrastructures facilitating interactions and collaboration.

Source: Author (2024).

Table 3. Relevance of value network elements in smallholder farming.

Elements	Inclusion/ Exclusion	Reasons
Actors and roles	Inclusion	Smallholder farmers, local buyers, and cooperatives are key actors; roles include producers and local traders.
Links and relationships	Inclusion	Relationships among farmers, buyers, and cooperatives are crucial for market access and resource sharing.
Flows and exchanges	Inclusion	Exchange of produce, money, and information is essential for farming operations and market participation.
Activities and mechanisms	Inclusion	Farming activities and mechanisms like traditional farming methods and local support systems are relevant.
Resources and competencies	Inclusion	Farmers rely on available resources like land, seeds, and labour, and competencies in traditional farming practices.
Value creation and co-creation	Inclusion	Creating value through collaborative efforts like cooperatives and local market linkages is vital.
Network dynamics and governance	Exclusion	Complex governance structures are less applicable; local community rules and norms are more relevant.
Sustainability and innovation	Exclusion	High-tech innovations are less applicable due to resource constraints; focus on sustainable traditional practices.
Consumer and market focus	Inclusion	Understanding consumer preferences and local market demands is crucial for selling produce.
Technological integration and platforms	Exclusion	Advanced technology integration is less applicable; limited access to digital platforms.

Source: Author (2024).

The next section presents the value network framework that can be adopted by smallholder farmers.

3.2. Value Network Framework for Smallholder Farming

The development of the value network (VN) framework for smallholder farming involved a systematic process to identify and incorporate the most relevant elements from existing research on VNs. As previously indicated, the study reviewed a range of prior research, identifying key elements such as actors, relationships, resource exchanges, and governance mechanisms (Refers to **Table 1**). These elements were then grouped to avoid redundancy which ensures comprehensive coverage of VNs (Refers to **Table 2**). Next, an inclusion/exclusion analysis was conducted to determine which elements were most applicable to the context of smallholder farming (Refers to **Table 3**). Elements, such as "actors and roles," "links and relationships," "flows and exchanges," "activities and mechanisms," "resources and competencies," "value creation and co-creation," and "consumer

and market focus" were included due to their direct impact on farming operations and market participation. In contrast, "network dynamics and governance," "sustainability and innovation," and "technological integration and platforms" were excluded because complex governance structures, high-tech innovations, and advanced technology integration were less applicable due to resource constraints and traditional farming practices. These included elements were organised into a VN, providing a coherent framework that addresses customer segments, market focus, actors and roles, relationships and interactions, flows and exchanges, activities and mechanisms, resources and competencies, and value creation and co-creation (See **Figure 2**). This structured approach ensures the framework is comprehensive and tailored to the specific needs and constraints of smallholder farmers, thus capturing the essence of each contribution from prior research, while providing a practical instrument for understanding and analysing VNs in this context.

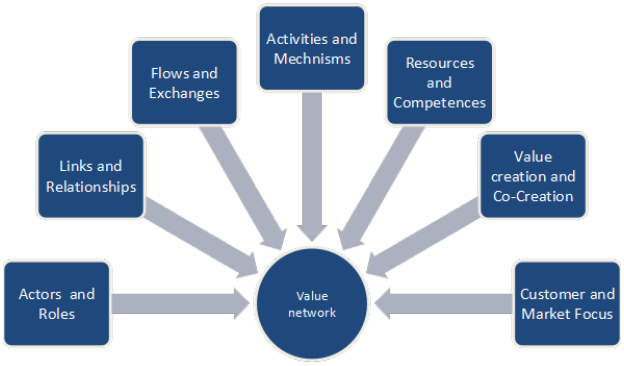

Figure 2. Value network framework for smallholder farming.
Source: Author (2024).

Below, this study defines the seven elements of a value network (VN) and applies them within the context of smallholder farming.

3.3. Actors and Roles

In value networks (VNs), actors are entities, such as individuals or organisations that create, exchange, and consume value. These actors, which include customers, suppliers, partners, employees, and regulatory bodies, perform specific roles such as procurement, production and distribution [41]. Roles are function-based, flexible, and vital for value creation [42]. The interaction between actors and their roles involves collaboration, coordination, and adaptation, which ensures the efficiency and effectiveness of networks. Clearly defining actors and roles enhances clarity, accountability, and strategic planning which optimise the network. The next section presents the links and relationships as one of the elements of the VN model of this study.

3.3.1. Links and Relationships

Links are the conduits through which value, information, and resources flow between actors, characterised by their directionality and strength. Conversely, relationships encompass qualitative aspects such as trust, reciprocity and formality [43]. The interplay between links and relationships significantly shapes network dynamics, thus contributing to enhanced efficiency, adaptability, and innovation [44]. For instance, in supply chains, strong financial and informational links between a manufacturer and supplier are fortified by trustful and enduring relationships [45]. The next section presents the flows and exchanges as one of the elements of the VN model of this study.

3.3.2. Flows and Exchanges

Flows and exchanges are key concepts defining the movement and interaction of resources, information, and value among actors. Flows describe the directional movement of assets, such as materials, goods, services, knowledge, and financial resources, characterised by their directionality, frequency, volume, and speed [46]. Exchanges refer to transactional interactions where resources, services, or information are reciprocally given and received, governed by norms and rules that regulate interaction terms and conditions [8]. Together, these concepts illustrate how resources circulate and combine within and across organisational boundaries, thus shaping network dynamics and enhancing competitive advantage. The next section presents the activities and mechanisms as one of the elements of the VN model of this study.

3.3.3. Activities and Mechanisms

Activities are the specific actions like production, service delivery, knowledge sharing, and innovation that

contribute to achieving network objectives [47]. Mechanisms encompass the organisational structures, processes, rules, governance frameworks, and communication channels that facilitate and govern these activities among network participants [48]. Together, these concepts shape how resources are mobilised, coordinated, and leveraged to enhance overall network performance and achieve collective goals. AI-driven technologies, like heat exchange predictions, offer significant potential to streamline these processes. A study by Taner et al. [49] highlighted how AI can optimize energy use and enhance efficiency in food processing. For smallholder farming, similar AI applications can be used to improve the efficiency of drying and cooling processes. Heat exchange predictions powered by AI can help farmers manage energy consumption more effectively, ensuring optimal temperatures and humidity for post-harvest operations. The next section presents the resources and competencies as one of the elements of the VN model of this study.

3.3.4. Resources and Competencies

Resources and competencies are fundamental concepts that underpin the capabilities and competitive advantage of network participants. Resources encompass tangible assets, such as physical infrastructure, financial capital, and human skills, as well as intangible assets like intellectual property and brand reputation [50]. These resources form the foundation upon which organisations build their strategic capabilities. Competencies, meanwhile, represent the organisational skills and capabilities that enable effective resource deployment and value creation. These include technological expertise, managerial capabilities, innovation capacity, and operational efficiencies [51]. Together, resources and competencies define the ability of organisations within VNs to collaborate effectively, innovate, and leverage their strengths to achieve strategic objectives and sustain competitive advantage in business environments. Efficient energy management is a critical competency that can significantly enhance the performance of VNs. Taner [52] illustrates how optimizing energy use is vital in achieving cost-effective and sustainable operations. The next section presents value creation and co-creation as one of the elements of the VN model of this study.

3.3.5. Value Creation and Co-Creation

Value creation involves transforming resources and competencies into valuable outputs that meet market needs and contribute to sustainability [53]. Co-creation emphasises collaborative processes where stakeholders jointly participate in creating value through shared activities like product development and innovation, integrating diverse insights and enhancing relationships [54]. Together, these concepts focus on the interactive nature of value generation, thus promoting innovation and responsiveness to stakeholder preferences and market dynamics. The next section presents the consumer and market focus as one of the elements of the VN model of this study.

3.3.6. Consumer and Market Focus

Consumer focus emphasises understanding and meeting consumer needs through tailored offerings and personalised experiences [55]. This approach aims to enhance satisfaction and loyalty by aligning products and services with consumer preferences. AI-driven technologies are transforming how value networks align production with consumer preferences. Oztuna Taner and Çolak [56] examined how AI can optimize processes to meet consumer demands while extending the shelf life of agricultural products. Integrating AI tools into their VNs could help anticipate market trends and ensure that their produce meets quality and demand standards. Market focus extends this perspective to include broader market dynamics, such as competitors, trends, regulations, and economic factors [57]. It involves identifying and prioritising market opportunities, optimising resource allocation, and aligning strategies to capitalise on emerging trends and consumer demands. Together, these orientations enable organisations to navigate competitive landscapes effectively and innovate strategically within dynamic market environments. The overall research objective was to examine the effect of VN on OP. The next section presents OP as one of the constructs of this study.

3.4. Operational Performance

Operational performance (OP) refers to an organisation's capacity to optimise its processes to maximise

output, while minimising costs and enhancing service speed, flexibility, and quality [7]. Both financial and non-financial metrics are commonly used to measure OP [58]. To maintain competitiveness, organisations must focus on their internal operations, including product and process quality, effectiveness, productivity, and overall OP [59]. Oztuna Taner [60] demonstrates the importance of analyzing energy and resource flows to improve efficiency. This study highlights how energy optimization can significantly reduce operational costs while maintaining product quality. Operational strategies are crucial for implementing competitive corporate strategies, thus emphasising factors such as cost, time, quality, and delivery reliability [61]. Key metrics for OP include production cost, flexibility, quality, energy efficiency, maintenance costs, and reliability [62]. Effective management of these activities can significantly enhance OP by reducing costs and improving service levels through the acquisition of specialised capabilities. **Table 4** presents the dimensions of OP.

Table 4. Operational performance constructs.

	Dimension	Author(s)
Operational Performance (OP)	Quality	Mlambo, Mageto & Thaba [7]
	Efficiency	Škrinjar, Bosilj-Vukšić and Indihar-Štemberger [58]
	Flexibility	Khan, Idrees, Rauf, et al., [59]
	Delivery	Oztuna Taner [60]
	Cost saving	Rosenzweig, Roth and Dean. Jr., [61]
	Energy efficiency	Mohamed, Al-Jaroodi and Lazarova-Molnar [62]

Source: Author (2024).

The next section provides the discussion on the effect of value networks on operational performance.

3.5. Effects of Value Networks on Operational Performance

Value networks (VNs) play a pivotal role in enhancing the operational performance (OP) of firms. Networks help firms achieve greater efficiency, quality, innovation, and customer satisfaction by fostering collaboration and optimising resources. One critical area of improvement is reducing food waste through technological advancements. Taner [52] emphasized how the adoption of innovative post-harvest technologies, such as vacuum freeze-drying, can significantly enhance the shelf life of agricultural produce. These technologies align with the objectives of VNs by minimizing waste and improving the quality of produce, enabling smallholder farmers to achieve higher market value and reduced costs. Oztuna Taner [60] highlights how energy-efficient solutions contribute to sustainable practices while enhancing product quality. Smallholder farmers can not only optimize resource usage but also align their practices with sustainability goals, further strengthening their OP. The co-creation of value is linked to the interaction process between companies involved in a network [63]. Zelbst et al. [64] examine the impact of various types of supply chain linkages (supplier, internal, and customer linkages) on overall supply chain performance. The study found that strong supplier linkages contribute to improved supply chain performance by enhancing material flow and reducing lead times. Nour [65] investigates how relational capital, facilitated through customer relationship management (CRM) and VNs, contributes to competitive advantage and OP. Specifically, firms that effectively manage relationships within their networks experience enhanced OP. This includes improved responsiveness to customer needs, better resource allocation, and increased efficiency in value creation processes. Gligor and Holcomb [66] examine how logistics capabilities are often integral to VNs influence supply chain agility, which in turn affects OP. Logistics capabilities, which are often intertwined with network capabilities, are crucial for enhancing supply chain agility. Agile supply chains, in turn, contribute to improved OP by enabling quicker responses to market changes, reducing lead times, and improving overall efficiency. Oliva and Kallenberg [67] discuss how firms transitioning from product-centric to service-oriented business models must leverage networks to optimise service deliv-

ery and enhance OP. Effective management of networks helps firms optimise service delivery processes, leading to improved OP. This includes increased service reliability, better customer satisfaction, and enhanced flexibility in adapting to changing customer demands.

Tajeddini, Martin and Ali[68] found that firms with strong business networks have improved business performance. These networks provide the support and resources necessary to implement innovative ideas and take advantage of market opportunities, thus enhancing overall performance. Li and Zobel[69] highlight how the structure of the supply chain network can influence its resilience. More interconnected and diversified networks tend to be more resilient. Seiler, Papanagnou and Scarf[70] found that businesses with higher centrality i.e., those that are more connected within the network tend to have better financial performance. Cavallari, Crippa and Perego[44] examine how the structure and capabilities of supply networks contribute to enhancing organisational resilience. The study highlights that firms with resilient supply networks are better equipped to manage disruptions and improve OP through enhanced flexibility and responsiveness. Paulraj, Chen and Blome[71] explore how supply network capabilities facilitate sustainability performance improvements. Effective management of these capabilities enables firms to achieve environmental and social goals while enhancing operational efficiency and competitive advantage. Lee and Lee[6] examine how value co-creation networks influence firm performance, with a focus on environmental dynamism as a moderating factor. The study shows that firms engaged in networks are more adaptable, which led to improved OP in fluctuating market conditions. VNs can enhance OP by improving collaboration and resource efficiency in smallholder farming. These networks connect farmers with suppliers, buyers, and service providers, leading to better crop quality, reduced costs, and faster market response. Strengthening these linkages helps smallholder farmers optimise processes, reduce inefficiencies, and improve resilience to market and environmental challenges. Farmers can enhance productivity, service reliability, and overall operational efficiency, which leads to better performance in a competitive agricultural environment. The next section discusses the key findings of this study. These were aligned to the research objectives of the study.

4. Discussion

The first research objective was to determine the impact of key actors and their specific roles, links and relationships, and flows and exchanges on the operational performance (OP) of smallholder farmers within resource constrained countries. The findings align with existing literature on the importance of clearly defined roles and responsibilities in enhancing OP. For instance, Moreddu[72] emphasizes that minimizing task overlaps through well-defined roles enhances accountability, productivity, and flexibility. This resonates with the study by Altay, Berriche and Acerbi[73], which highlights the role of strong stakeholder relationships in fostering communication and reducing delays. Similar findings are reported in[74], who observed that collaborative relationships among stakeholders improve the adaptability of smallholder farmers to market dynamics. The importance of efficient flows of information and resources, as highlighted by Abdelkafi, Ben Romdhane and Mefteh[75] and Javaid et al.[76], is supported by studies like Gamal et al.'s[74], which show that timely access to resources significantly boosts operational efficiency.

The second objective of the research was to evaluate the influence of supply chain activities, mechanisms, and competencies on the operational performance (OP) in smallholder farming within resource-constrained countries. The results are consistent with findings in similar agricultural contexts. For example, Kumar et al.[55] and Heydari[77] emphasize the role of standardized farming practices in reducing errors and improving produce quality. This is further supported by[78], who demonstrate that streamlined processes enhance both yield quality and operational efficiency. These findings mirror those in studies on smallholder vegetable farmers in Kenya, where Mwangi, Isaboke and Ndirangu[79] found that high farming competencies and resource availability were critical in adapting to changing market demands.

The third objective of the research was to analyse the role of value creation, co-creation, and con-

sumer/market focus in enhancing the operational performance (OP) in smallholder farming within resource-constrained countries. Collaborative value creation, as described by Türkeş, Stăncioiu and Marinescu [80] and Kuoribo et al. [81], has proven effective in reducing inefficiencies and costs while leveraging stakeholder strengths. These findings align with studies on smallholder tea farmers in India, where Singh, Budhiraja and Vatta [82] highlighted the transformative impact of stakeholder collaboration on OP. The consumer and market focus observed in this study is like findings by Crittenden et al [83], who emphasized the importance of aligning production with consumer preferences to reduce waste and improve marketability. These findings align with broader challenges in smallholder farming and provide insights that extend beyond Africa, reflecting common issues in resource-constrained agricultural settings.

5. Theoretical Implications

The study advances stakeholder theory by contextualising it within smallholder farming which highlighted the diverse actors, including farmers, buyers, suppliers, cooperatives, and government agencies. This study emphasised how inclusive decision-making, rooted in stakeholder theory, can improve OP by addressing economic, social, and environmental concerns. Network theory complements this by explaining the structural relationships between these actors and mapping interactions that influence resource access and operational efficiencies. When combining these two theories, the study offers a comprehensive model that addresses the unique challenges faced by smallholder farmers in fragmented markets. The study contributes to the literature by developing a VN framework specifically for smallholder farming,, with broad applicability across diverse agricultural contexts. The framework identifies how these components interact to influence OP, focusing on the dynamics of rural agricultural networks. This tailored framework addresses the realities of smallholder farming, such as limited access to technology, fragmented markets, and resource constraints, thus offering insights for enhancing productivity and sustainability. The next section presents the practical contributions and implications to stakeholders.

6. Practical Contributions and Implications for Stakeholders

The study highlights that participation in value networks (VNs) enhances smallholder farmers' operational performance (OP) by providing better access to resources, markets, and support services. These networks foster efficiency in production and distribution which lead to increases in yields and income. Farmers can sell their produce more easily at better prices through organised networks, which reduces the reliance on intermediaries and increases profit margins. When joining cooperatives or networks, smallholder farmers can enhance their collective bargaining power, improving access to better inputs, fairer prices, and more favourable contract terms with buyers. Enhanced OP contributes to greater income stability, which can improve the economic well-being and quality of life for farmers. The study suggests that strengthening VNs can play a critical role in boosting agricultural productivity and addressing rural development challenges. The government can use these findings to develop policies that support the creation and expansion of VNs in the agricultural sector, focusing on improving market access and supporting infrastructure for smallholder farmers. Prioritising investment in agricultural extension services by training extension officers and providing resources ensures better support for farmers, helping them adopt best practices in farming and engage with VNs effectively. The government can encourage public-private partnerships aimed at investing in agricultural infrastructure, such as roads, storage facilities, and communication technologies, which would improve the overall efficiency of VNs and smallholder farmers' access to markets. When supporting smallholder farmers through these policies, governments can drive rural development, reduce food insecurity, and increase the sector's contribution to the national economy. The private sector plays a crucial role in supporting VNs by offering essential services and infrastructure that smallholder farmers need to improve their operational efficiency. Agribusinesses can explore investment opportunities in input provision, and pro-

cessing facilities that add value to agricultural products. This can lead to profitable ventures, while also supporting smallholder farmers in improving their productivity. Companies can establish reliable supply chains that benefit both smallholder farmers and larger agribusinesses, creating a mutually beneficial relationship that enhances the competitiveness of agricultural products both domestically and internationally. NGOs and development agencies are key stakeholders in promoting sustainable farming practices and improving farmers' access to markets through VNs. NGOs can focus on helping smallholder farmers adopt environmentally sustainable practices through VNs, which improve not only productivity but also long-term resilience in farming. VNs provide consumers with more consistent and higher-quality agricultural products due to the increased efficiency and improved OP of smallholder farmers. As farmers gain better access to input and improve their production processes through VNs, consumers are likely to benefit from higher-quality produce and other agricultural products, potentially at lower prices. Therefore, findings of this study provide insights for policymakers, agribusinesses, and NGOs supporting smallholder farmers across diverse agricultural contexts, not limited to Africa. The next section presents the limitations and sets the agenda for future research.

7. Conclusions

In conclusion, value networks (VNs) significantly enhance operational performance (OP) in smallholder farming by fostering collaboration, optimising resource utilisation, and aligning production with market demands. These improvements can lead to superior quality, efficiency, flexibility, delivery, and cost savings, which boost market competitiveness and farmer livelihoods. This study demonstrates the importance of resource sharing and collaborative efforts through VNs in smallholder farming generally, providing insights that may apply to various crops and contexts, including Zimbabwe. These networks enable smallholder farming to overcome critical challenges like limited market access, insufficient farming inputs, and fragmented stakeholder coordination. Well-established VNs enhance the adaptability of smallholder farmers to market changes, thereby improving their competitiveness and sustainability. Another major insight is the role of value co-creation in this study. Through involving multiple stakeholders, including agribusinesses, NGOs, and policymakers, smallholder farmers can benefit from shared resources, expertise, and market knowledge, which improve both productivity and profitability. This collaborative approach allows smallholder farmers to adopt more consumer-focused strategies, aligning production with market demands and preferences, which further enhances their operational efficiency and marketability. The study also highlights practical implications for stakeholders. Governments, policymakers, and development organisations can use these findings to design interventions that promote value network participation, improve market infrastructure, and strengthen agricultural extension services. This study provides a comprehensive framework for understanding the influence of VNs on the OP in smallholder farming. VNs are not only instrumental in boosting operational efficiency but also play a key role in fostering sustainable agricultural practices and rural development. This study provides generalised insights into smallholder farming and highlights the need for further empirical research to validate the proposed framework in specific settings. The next section presents the theoretical contribution of this study.

8. Limitations and Future Research Directions

The study acknowledges its rigorous approach but identifies some limitations that suggest avenues for further research. It employed SLR, a method which is interpretive and subjective. This subjectivity arises because the selection of studies, coding of data, and synthesis of findings are influenced by the judgments and perspectives of researchers. Even though steps were taken to minimise bias, such as employing clear inclusion and exclusion criteria, using multiple academic databases, and conducting independent evaluations by multiple researchers, there remains a degree of interpretative variability that could influence the conclusions. The study contributes to the existing knowledge by proposing a

value network model which provides theoretical and practical insights into how OP can be improved in smallholder farming in Africa. A key limitation of this study is the lack of empirical data specific to smallholder paprika farming. Future research should address this by collecting case-specific data to validate the proposed framework. Future research could broaden this perspective by integrating social and environmental performance variables as potential mediators in the proposed value network model.

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Institutional Review Board Statement

This study complied with the ethical guidelines and research policy of the University of Johannesburg. Ethical approval was obtained from the Ethics Committee of the University of Johannesburg under approval number 2021-TSCM012. This ensured the protection of the interests of the university and researchers.

Informed Consent Statement

Not applicable. This study did not involve human participants, as it is based solely on a systematic literature review. Therefore, no informed consent was required.

Data Availability Statement

This study is based on a systematic literature review; therefore, no primary data was collected from respondents. As such, no new data was generated or analyzed. All sources of information are from publicly available literature referenced within the article.

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Conflicts of Interest

The author declares no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviation

SLR	Systematic Literature Review
VN	Value Network
OP	Operational Performance
IFAD	International Fund for Agricultural Development
FAO	Food and Agriculture Organization
SME	Small and Medium-Sized Enterprise
GDP	Gross Domestic Product
NGO	Non-Governmental Organization
GVC	Global Value Chain
IoT	Internet of Things

References

[1] International Fund for Agricultural Development (IFAD). 2019. Rural development report: Creating opportunities for rural youth. RDR 2019, 17 October 2019.

[2] World Bank, 2022. Zimbabwe economic update: A balancing act - recovery from the pandemic and transition to private sector-led growth. 177291-ZW, 30 June 2022.

[3] Food and Agriculture Organization (FAO). 2023. The state of food security and nutrition in the world. Report number CC3017EN, 6 July 2022.

[4] World Bank. 2025. Zimbabwe economic update: Building resilience for sustainable growth. 191028-ZW, 31 January 2025.

[5] Food and Agriculture Organization (FAO), 2023. Lessons from China's farmers in green growth transformation. Food and Agriculture Organization of the United Nations. 23 March 2023.

[6] Lee, J., Lee, H., 2001. The impact of business networks on firm performance. Journal of Business Research. 54(1), 69–82.
[7] Mlambo, M., Mageto, J., Thaba, S., 2024. Environmental sustainability and operational performance in the road freight sector. Acta Logistica (AL). 11(1), 1–12.
[8] Wang, Q., Chen, H., 2019. The impact of trust and reciprocity in business networks on firm performance. Journal of Business and Industrial Marketing. 34(5), 856–872.
[9] Zamasiya, B., Mango, N., Nyikahadzoi, K., et al., 2014. Determinants of soybean market participation by smallholder farmers in Zimbabwe. Journal of Development and Agricultural Economics. 6(2), 49–58.
[10] McKitterick, L., Quinn, B., McAdam, R., et al., 2016. Innovation networks and the institutional actor-producer relationship in rural areas: The context of artisan food production. Journal of Rural Studies. 48, 41-52.
[11] Teece, D.J., 2018. Business models and dynamic capabilities. Long Range Planning. 51(1), 40–49.
[12] Adner, R., Kapoor, R., 2010. Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. Strategic Management Journal. 31(3), 306–333.
[13] Hämäläinen, T., Heiskanen, E., 2012. Value networks in sustainable consumption: Analysing potential for systems change. Journal of Cleaner Production. 19(1), 84–93.
[14] Keranen, O., Makkonen, H., Tinnilä, M., 2021. Restructuring existing value networks to diffuse sustainable innovations in food packaging. Journal of Business Research. 124, 561–571.
[15] Srivastava, R.K., Shervani, T.A., Fahey, L., 2014. Marketing, business processes, and shareholder value: An organisationally embedded view of marketing activities and the discipline of marketing. Journal of Marketing. 63(4_suppl1), 168–179.
[16] Santos, R.P., Abubakar, Y., Barros, A.C., et al., 2019. Joining global aerospace value networks: Lessons for industrial development policies. Technological Forecasting and Social Change. 146, 193–207.
[17] Ratajczak-Mrozek, M., 2012. Global business networks and cooperation within supply chain as a strategy for high-tech companies' growth. Journal of Entrepreneurship, Management and Innovation. 8(1), pp.35-51.
[18] Ehret, M., 2004. Managing the trade-off between relationships and value networks. Towards a value-based approach of customer relationship management in business-to-business markets. Industrial Marketing Management. 33(6), 465-473.
[19] Beckie, M.A., Kennedy, E.H., Wittman, H., 2012. Scaling up alternative food networks: Farmers' markets and the role of clustering in western Canada. Agriculture and Human Values. 29, pp.333-345.
[20] Freeman, R.E., Phillips, R., Sisodia, R., 2020. Tensions in stakeholder theory. Business & Society. 59(2), 213–231.
[21] Littlewood, D., Ciambotti, G., Holt, D., et al., 2022. Special issue editorial: Social innovation and entrepreneurship in Africa. Africa Journal of Management. 8(3), 259–270.
[22] Kramer, M.P., Bitsch, L., Hanf, J., 2021. Blockchain and its impact on agri-food supply chain network management. Sustainability. 13(4), 2168.
[23] Ezeudu, T.S., Obimbua, E.N., 2024. Enhancing rural market access and value chain integration for sustainable agricultural development in Nigeria: A study of constraints, strategies, and implications. International Journal of Research and Innovation in Social Science. 8(3), 528–550.
[24] Conway, S., Jones, O., Steward, F., 2001. Realising the potential of the network perspective in researching social interaction and innovation. Technology Analysis & Strategic Management. 13(1), 23–40.
[25] Peppard, J., Rylander, A., 2006. From value chain to value network: Insights for mobile operators. European Management Journal. 24(2–3), 128–141.
[26] Allee, V., 2008. Value network analysis and value conversion of tangible and intangible assets. Journal of Intellectual Capital. 9(1), 5–24.
[27] Helander, N., Kukko, M., 2009. A value-creating network analysis from the software business. International Journal of Production Economics. 118(1), 37–45.
[28] Torugsa, N.A., O'Donohue, W., Hecker, R., 2012. Capabilities, proactive CSR and financial performance in SMEs: Empirical evidence from an Australian manufacturing industry sector. Journal of Business Ethics. 109(4), 483–500.
[29] Shang, X., Qi, Y., 2013. Value networks in global manufacturing: Theory and application. International Journal of Production Economics. 146(1), 231–244.
[30] Al-Debei, M.M., Aloudat, A., Al-Lozi, E., et al., 2014. The role of value networks in the design of mobile platforms: The case of Apple iPhone. Approaches and Processes for Managing the Economics of Information Systems. IGI Global: Hershey, PA. USA. pp. 123–137.
[31] Grudinschi, D., Hallikas, J., Kaljunen, L., et al., 2014. Creating value in networks: Assessing the current and potential value networks in cross-sector collaboration. Journal of Business & Industrial Mar-

keting. 29(5), 405–416.
[32] Makkonen, H., Pohjola, M., Olkkonen, R., et al., 2015. Dynamic capabilities and organisational performance: The effect of knowledge management capabilities. Journal of Business Research. 68(7), 1490–1499.
[33] Dentoni, D., Krussmann, F., 2015. Value network analysis of Malawian legume systems: Implications for institutional entrepreneurship. Journal of Agribusiness in Developing and Emerging Economies. 5(2), 115–136.
[34] Hagen, B., succhella, A., Cerchiello, P., et al., 2018. International strategy and performance—Clustering strategic types of SMEs. International Business Review. 27(3), 491–504.
[35] Patrício, L., De Pinho, N.F., Teixeira, J.G., et al., 2018. Service design for value networks: Enabling value co-creation interactions in healthcare. Service Science. 10(1), 76–97.
[36] Galle, W., Matti, C., 2022. Value network mapping: A method for unravelling system relations. Journal of Business Research. 141, 492–506.
[37] Wang, H., Jin, J., Shang, H., 2020. Smart cities in China: Dynamics and policy implications. Journal of Urban Technology. 27(1), 67–87.
[38] Komorowski, M., Lupu, A., Pepper, M., et al., 2021. Joining the dots-understanding the value generation of creative networks for sustainability in local creative ecosystems. Sustainability. 13(1), 89.
[39] Dawson, R., Danielsson, P., 2021. Value network analysis of digital platforms: The role of network effects, data governance, and platform openness. Journal of Business Research. 134, 49–59.
[40] Galle, W., Debacker, W., De Weerdt, Y., et al., 2019. Housing in the circular economy: lessons from value network mapping as a transition experimentation tool. Journal of Cleaner Production. 219, 97–107.
[41] De Silva, M., Howells, J., Meyer, M., 2018. The different roles of innovation intermediaries to generate value. Management Review Quarterly. 74, 2545–2577.
[42] Lee, B., Cooper, R., Hands, D., et al., 2018. [Re]-imagining vision and values: Design as a driver for value creation in the Internet of Things. Proceedings of the Living in the Internet of Things: Cybersecurity of the IoT-2018; March 28–29, 2018; London, UK. pp. 1–11.
[43] Ferdows, K., Sweeney, E., 2023. Relational contracting in supply chains: How relationships shape supplier performance. Journal of Operations Management. 71, 112–130
[44] Cavallari, M., Crippa, L., Perego, A., 2022. Enhancing firms' resilience: The role of supply network structure and capabilities. International Journal of Operations & Production Management. 42(2), 222–248.
[45] Pfeffer, J., Salancik, G.R., 2022. External Control of Organisations: A Resource Dependence Perspective. Stanford Business Books: Palo Alto, CA, USA. pp. 127-307.
[46] Galunic, D.C., Rodan, S., 2021. Resource redeployment and firm performance: A network perspective. Strategic Management Journal. 42(13), 2598–2623.
[47] Gulati, R., 2021. Managing Network Resources: Alliances, Affiliations, and Other Relational Assets. Oxford University Press: Oxford, UK. pp. 101-266.
[48] Gulati, R., Puranam, P., 2020. Network Advantage: How to Unlock Value from Your Alliances and Partnerships. Harvard Business Review Press: Boston, MA, USA. pp. 134-247.
[49] Taner, O.O., Mercan, H., Çolak, A.B., et al., 2024. Application of artificial intelligence techniques for heat exchange predictions in the food industry. In: Ali, H.M. (ed.). Advanced Materials-Based Thermally Enhanced Phase Change Materials. Elsevier: Amsterdam, The Netherlands. pp. 269–325.
[50] Barney, J.B., 2020. Firm resources and sustained competitive advantage. Journal of Management. 46(5), 801–827.
[51] Prahalad, C.K., Hamel, G., 2020. The core competence of the corporation revisited. Strategic Management Journal. 41(12), 2345–2371.
[52] Taner, O.O., 2024. Sustainable food and agriculture production: Reducing food waste through technological advancements and assessing its economic impact. Research on World Agricultural Economy. 5(3), 144–165.
[53] Porter, M.E., 2021. Competitive Advantage: Creating and Sustaining Superior Performance. Harvard Business Review Press: Boston, MA, USA.
[54] Prahalad, C.K., Ramaswamy, V., 2020. Co-creating unique value with customers. Strategy & Leadership. 48(3), 22–29.
[55] Kumar, V., Possa, I.D., Ganesh, J., 2021. Customer Experience Management: Maximising Customer Satisfaction, Loyalty, and Profitability. Springer: Berlin, Germany. pp. 123-156.
[56] Oztuna Taner, O., Çolak, A.B., 2024. Dairy factory milk product processing and sustainable shelf-life extension with artificial intelligence: A model study. Frontiers in Sustainable Food Systems. 8, 1344370.
[57] Kotler, P., Kartajaya, H., Setiawan, I., 2020. Marketing 4.0: Moving from Traditional to Digital. John Wiley & Sons: Hoboken, NJ, USA. pp. 141–198.
[58] Škrinjar, R., Bosilj-Vukšić, V., Indihar-Štemberger, M., 2008. The impact of business process orientation on financial and non-financial perfor-

mance. Business process management journal, 14(5), 738–754.
[59] Khan, M.T., Idrees, M.D., Rauf, M., et al., 2022. Green supply chain management practices' impact on operational performance with the mediation of technological innovation. Sustainability. 14(6), 3362.
[60] Oztuna Taner, O., 2024. Enhancement of the energy and exergy analysis capabilities of the yoghurt process: A case study of the dairy industry. Frontiers in Sustainable Food Systems. 8, 1450653.
[61] Rosenzweig, E.D., Roth, A.V. Dean Jr, J.W., 2003. The influence of an integration strategy on competitive capabilities and business performance: an exploratory study of consumer products manufacturers. Journal of operations management, 21(4), 437–456.
[62] Mohamed, N., Al-Jaroodi, J., Lazarova-Molnar, S., 2019. Leveraging the capabilities of industry 4.0 for improving energy efficiency in smart factories. Ieee Access, 7, 18008–18020.
[63] Nour, R., 2022. Enhancing the Logistics 4.0 Firms through Information Technology. Sustainability. 14(23), 15860.
[64] Zelbst, P.J., Green Jr, K.W., Sower, V.E., et al., 2009. Impact of supply chain linkages on supply chain performance. Industrial Management & Data Systems. 109(5), 665–682.
[65] Nour, R., 2022. Enhancing the Logistics 4.0 Firms through Information Technology. Sustainability. 14(23), 15860.
[66] Gligor, D.M., Holcomb, M.C., 2014. Antecedents and consequences of integrating logistics capabilities across the supply chain. Transportation Journal. 53(2), 211–234.
[67] Oliva, R., Kallenberg, R., 2003. Managing the transition from products to services. International Journal of Service Industry Management. 14(2), 160–172.
[68] Tajeddini, K., Martin, E., Ali, A., 2020. Enhancing hospitality business performance: The role of entrepreneurial orientation and networking ties in a dynamic environment. International Journal of Hospitality Management. 90, 102605.
[69] Li, Y., Zobel, C.W., 2020. Exploring supply chain network resilience in the presence of the ripple effect. International Journal of Production Economics. 228, 107693.
[70] Seiler, A., Papanagnou, C., Scarf, P., 2020. On the relationship between financial performance and position of businesses in supply chain networks. International Journal of Production Economics. 227, 107690.
[71] Paulraj, A., Chen, I.J., Blome, C., 2022. Unlocking sustainability performance through supply network capabilities: A dynamic capabilities perspective. Journal of Business Research. 141, 222–234.
[72] Moreddu, C., 2016. Public-private partnerships for agricultural innovation: Lessons from recent experiences. No. 92. Paris, January 28, 2016.
[73] Altay, S., Berriche, M., Acerbi, A., 2023. Misinformation on misinformation: Conceptual and methodological challenges. Social media+ Society. 9(1), 20563051221150412.
[74] Gamal, H., Albahri, S., Essa, H., et al., 2024. Driving operational excellence: Cost savings and performance optimization through tripping and connection time optimization. Proceedings of The International Petroleum Technology Conference (IPTC); 12–14 February 2024; Dhahran Expo, Dhahran, Saudi Arabia.
[75] Abdelkafi, I., Ben Romdhane, Y., Mefteh, H., 2022. Economic issue and technological resilience of pre- and post-COVID-19. Arab Gulf Journal of Scientific Research. 40(4), 330–346.
[76] Javaid, M., Haleem, A., Khan, I.H., et al., 2023. Understanding the potential applications of Artificial Intelligence in the Agriculture Sector. Advanced Agrochem. 2(1), 15–30.
[77] Heydari, M., 2024. Cultivating sustainable global food supply chains: A multifaceted approach to mitigating food loss and waste for climate resilience. Journal of Cleaner Production. 442, 141037.
[78] Karunathilake, E.M.B.M., Le, A.T., Heo, S., et al., 2023. The path to smart farming: Innovations and opportunities in precision agriculture. Agriculture. 13(8), 1593.
[79] Mwangi, T.M., Isaboke, H.N., Ndirangu, S.M., 2021. Analysis of tomato market diversity among rural smallholder farmers in Kirinyaga County, Kenya. Heliyon. Journal of Agricultural Research. 8(4), 000324.
[80] Türkeş, M.C., Stăncioiu, A.F., Marinescu, R.C., 2024. Modeling the impact of resilience factors and relational practice on performance of the supply chain. Journal of Innovation & Knowledge. 9(3), 100533.
[81] Kuoribo, E., Amoah, P., Kissi, E., et al., 2024. Analysing the effect of multicultural workforce/teams on construction productivity. Journal of Engineering, Design and Technology. 22(3), 969–990.
[82] Singh, G., Budhiraja, P., Vatta, K., 2018. Sustainability of farmer producer organisations under agricultural value networks in India: A case of Punjab and Gujarat. Indian Journal of Agricultural Economics. 73(3), 370–385.
[83] Crittenden, V.L., Crittenden, W.F., Ferrell, L.K., et al., 2011. Market-oriented sustainability: a conceptual framework and propositions. Journal of the Academy of Marketing Science, 39, 71–85.