

Asset specificity, inter-firm ecosystem, firm adaptability and supply chain integration

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Abstract

Purpose – This study investigates the effect of asset specificity, inter-firm ecosystem and firm adaptability on supply chain integration. The study also investigates the mediation effect of firm adaptability on the relationship between asset specificity and supply chain integration and inter-firm ecosystem and supply chain integration.

Design/methodology/approach – This research applied a quantitative research methodology to investigate the interdependencies between study variables. A disproportionate stratified simple random sampling technique was used to select the firms that participated in the study. As a result, 103 food processing firms were selected from a total population of 345 firms located in Kampala district.

Findings – The findings reveal that the direct relationship between asset specificity and supply chain integration and inter-firm ecosystem and supply chain integration was found positive but insignificant. Both asset specificity and inter-firm ecosystem are associated positively with firm adaptability. A partial mediation was established between asset specificity and SCI while a full mediation effect was found in inter-firm ecosystem and SCI.

Research limitations/implications – The study used perceptual measures to obtain responses on the various constructs investigated and how these constructs relate. To avoid biasing the results, key suppliers and customers were not involved due to multi-level relationships that they maintain with various firms.

Originality/value – This study contributes to existing studies by applying two theories. First, the study applies the Transaction Cost Theory to study the effect of asset specificity on supply chain integration. Secondly, the Complexity Adaptive System Theory was applied to examine the influence of firm adaptability and inter-firm ecosystem on supply chain integration. Few studies have focused on the effect of inter-firm ecosystem in the supply chain; yet, SCI involves network of various player making supply chains complex. This study is among the few studies that have focused on adaptability in the food processing sector in a developing country like Uganda.

Keywords Asset specificity, Inter-firm ecosystem, Firm adaptability, Supply chain integration

Paper type Research paper

1. Introduction

Over the years, studies on supply chain integration (SCI) have been on the increase though less focus has been placed on developing economies (Khanuja and Jain, 2020; Ramanathan and Gunasekaran, 2014). These findings however contradict with those of Tiwari (2021) who revealed a decline in SCI studies between 2018 and 2020 which raises concerns. Globally, it could be due to global pressure to achieve sustainable development goals (Organization for Economic Cooperation and Development report, 2020; United Nations report, 2017) where

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firms that are not able to catch up are kicked out. The less focus on firms in developing countries could however be due to high levels of technological advancement which is key in SCI yet firms in these countries are not able to sustain it due to limited resources and uncertain benefits (Kanyoma *et al.*, 2020; Nguyen *et al.*, 2019).

In Uganda, integration and connectivity of operations are anchored on Uganda's 2040 development agenda and the focus is to bring together internal and external supply chain operations. It is also anticipated that integrating supply chain operations will promote shared planning and joint goal-setting between the focal firms and their trading partners (Tukamuhabwa *et al.*, 2021). These are possible where firms work together in their ecosystems.

However, creating an ecosystem environment where interdependencies exist in the food processing sector (FPS) in Uganda remains challenging because of the existence of free entry and exit with many of the firms not registered and unknown creating uncertain situations (Waiswa *et al.*, 2021). The FPS is further characterized by changing market demands (Siagian *et al.*, 2021). SCI is necessary in countries like Uganda that have limited sharing of information between partners regarding prices, production volumes and consumption patterns (Fowler and Rauschendorfer, 2019). This could be attributed to limited investment in specific assets. Current research shows low-capacity utilization among processors (Onward Resources International, 2016; Economic Policy Research Centre (EPRC), 2018; Munu, 2019). For example, Mukwano industries one of the leading producer of vegetable oil and fats in the country has capacity utilization ranging between 20 and 35% (Onward Resources International, 2016); the coffee industry has capacity utilization standing at 40%; fish processing is found to be less than 30%; dairy processors has an average capacity utilization of 66% and beef capacity utilization is less than 20%. At the industry level, capacity utilization in the dairy sector remains low between 40 and 60% (Makoni *et al.*, 2014). Most of these firms located in rural areas far from their markets making coordination and transportation almost impossible especially in rain seasons (Fowler and Rauschendorfer, 2019). Farida *et al.* (2024) also found limited investment in human specificity to foster SCI and adaptability in uncertain situation. All these examples indicate the presence of poor or low levels of SCI in the FPS.

Because supply chains in developing countries are complex and uncertain the study utilizes the Transaction Cost Theory (TCT) and Complexity Adaptive System Theory (CAST) to understand the costs and complexities that emerge when firms interact with the market. What makes SCI complex is the multi-level interconnectedness and interrelated relationships that exist between the firm and its different partners (Jacobides *et al.*, 2018; Christopher, 2011). These multi-level interactions create visibility and forecasting problems that come with costs (Jambulingam and Kathuria, 2020; Jose and Shanmugam, 2019). The TCT assumes that individuals are generally opportunistic and this is the main cause of costs in transactions which food processing firms (FPFs) need to understand. In managing these inter-firm relationships, complexities emerge due to differences in objectives, interests and values leading to further costs of monitoring and coordination (Williamson, 1985). To maintain these multi-level relationships, firms have to focus on the interdependencies (Helfat and Raubitschek, 2018). Thus, this study aimed at examining the influence of asset specificity, inter-firm ecosystem and firm adaptability on SCI. The rest of the paper is grouped as follows: Section 2 discussed the theoretical review and literature review; the methodology is discussed in Section 3. Findings are presented in Section 4 and Section 5 contains a discussion of findings and Section 6 looks at the recommendations and conclusion.

2. Theoretical review

2.1 Transaction Cost Economics Theory (TCET)

To understand the costs that come with integrating supply chain operations, scholars have used the TCET (Ketokivi and Mahoney, 2020; Turkulainen *et al.*, 2017). As firms integrate with multiple suppliers in the market, they are faced with different kinds of costs like bargaining costs and switching costs (Huang and Huang, 2018; Williamson, 1971). This is because such

firms are investing in specific assets like location specificity, dedicated specificity and human specificity to meet the different needs of the market (Williamson, 1985; Jambulingam and Kathuria, 2020). This also increases the cost of monitoring the behavior of partners, usage of assets for intended purpose and coordinating transactions in the different markets (Williamson, 1975, 1985; Yigitbasioglu, 2010). Christopher (2011) warns that external partners are connected to a web of many other firms and this may result into opportunistic tendencies, create visibility and forecasting challenges. This further makes supply chains complex and non-linear (Abbasi and Varga, 2021; Ciliberti *et al.*, 2020). To address that, firms have to view SCI as a complexity concept by applying CAST with an objective of bringing order in non-linear situations (Urry, 2005).

2.2 Complexity Adaptive System Theory (CAST)

The complexity adaptive system assumes that organizations operate in a changing environment which necessitates the need to learn and adapt to new ways of doing things (McMillan, 2008). Firms are at different levels of production and therefore for them to survive, collaborative relationships are created that allow them to share vital information. Each component and each intersection exhibit different skills, competencies and roles. To respond to such dynamic in the market, organizations co-exist as ecosystems interacting with various components like suppliers and customers in a web. An ecosystem relates to a collective arrangement of many different firms through which issues related to uncertainty in transactions are addressed (Ciliberti *et al.*, 2020). Firms that join the ecosystem have different values, norms and cultures called attractors that they have to adjust to those of the collaboration (Goldstein *et al.*, 2010).

Additionally, the CAST assumes that the success of any firm is highly dependent on the scope and quality of the network. This depends on how the firms align their attractors, depend on each other and also maintain the connectedness through feedback and learning. Goldstein *et al.* (2010) note that this is the heart of the complexity adaptive system theory. Complexity arises when two firms each with different thinking and information interact (Goldstein *et al.*, 2010). Because of differences in objectives, opportunism in the ecosystems increases calling for adaptive strategies that focus on new ways of responding, copying and producing new behaviors previously unseen (McMillan, 2008).

Therefore, in this study, TCT is a theory of costs that are involved in SCI when firms invest in specific assets to foster market relationships while the CAST is to bring order and make firms adaptive to the dynamics that emerge in the market (Goldstein *et al.*, 2010). Hence, we expect a direct link from asset specificity and SCI through the lens of TCT. The study also anticipates a direct impact of inter-firm ecosystem and firm adaptability on SCI through the lens of CAST. The interplay between asset specificity and SCI through firm adaptability is through the complementary role of CAST.

2.3 Literature review and hypotheses development

2.3.1 Asset specificity and supply chain integration. Asset specificity in this study has been operationalized focusing on dedicated specificity, human specificity and location specificity. Asset specificity drives integration in the supply chain through vertical integration (Ketokivi and Mahoney, 2020; Williamson, 1985). When firms invest in locations close to their trading partners, they achieve SCI (Bennett and Klug, 2012). When firms are in closer proximity, they frequently interact, share information (Balland *et al.*, 2015) and quickly introduce products to the market (Huo *et al.*, 2014). This reduces transaction costs and the reverse is true when they are located far from the market as they have to incur higher costs to monitor and coordinate the different markets (Ketokivi and Mahoney, 2020). Therefore transaction costs are high where firms are dealing with partners that are geographically dispersed necessitating firms to further invest in dedicated assets like delivery trucks, warehousing facilities and technology to track items (Jean *et al.*, 2021).

The firms' dedicated assets like technology drive integration especially where firms and their resources are geographically dispersed (Yu *et al.*, 2020). This improves supply chain visibility and quickens decision making (Gu *et al.*, 2020). The use of technological systems reduces mistakes in transactions, improves sharing of real time information and aligns the internal functions of a firm to the market (Oubrahim *et al.*, 2023).

However, the level of SCI in developing economies has been limited due to limited skills and structures to implement advanced technology (Kalubanga and Namagembe, 2021). Also, Li *et al.* (2023) noted that increase in investment in specific assets can result into increased transactional costs with its lock-in effect. According to the TCT, costs are also a result of monitoring and enforcement (Williamson, 1985).

Human specificity results in task accomplishment (Song and Song, 2021). Accordingly, human specificity is the extent to which specialized human capital is attained through training. Zhao *et al.* (2023) revealed that training improves employee knowledge and skills promoting effective sharing within the supply chain. Relatedly, multi-skilled employees are in position to understand market demands and this has an influence on integration (Murfield *et al.*, 2017). Strong firms should offer technical support to the weaker firms in the chain (Bhardwaj and Ketokivi, 2020). Such arguments have resulted to the formulation of the first hypothesis stated further in the text.

H1. Asset specificity positively influences supply chain integration.

2.3.2 Inter-firm ecosystem and supply chain integration. Developing an ecosystem is one way through which firms address issues related to uncertainty (Ciliberti *et al.*, 2020). Though greatly explored in business (Rong *et al.*, 2012); entrepreneurship (Sheriff and Muffatto, 2015) and innovation studies (Mikhailov *et al.*, 2021), ecosystem studies in supply chain are few (Sheriff and Muffatto, 2015). Zhao *et al.* (2023) recommend that players should join associations to enable them communicate their interests. Inter-firm ecosystem will be studied focusing on: interdependence (Burford *et al.*, 2021), stakeholder involvement and standard operating procedure (SOP) (Liu *et al.*, 2019; Alinaghian *et al.*, 2020).

Creating interdependence within a supply chain is critical to achieving shared outcomes (Kembro and Selviaridis, 2015). The drive behind interdependence is resource scarcity (van Dijk *et al.*, 2021). Accordingly, actors create a common forum like WhatsApp groups for purposes of sharing common information. Ecosystems are characterized by opportunism but they diminish with interdependence (Kanyoma *et al.*, 2018). However, interdependence thrives best where firms are of the same size (Selviaridis and Spring, 2018) with multi-level relationships (Adner, 2017; Kembro and Selviaridis, 2015).

In an ecosystem, partner involvement has also been identified as a key driver of SCI (Alam *et al.*, 2014). Just like many scholars have recommended trust as critical issue in SCI, Shan *et al.* (2023) also posit that partner involvement will foster positive results in a supply chain when partners have trust in each other. It plays a critical role in understanding the firm's operating supply chain environment (Magassouba *et al.*, 2019). It may be through physical interaction or via social media platforms to allow information sharing and collaboration (Cheng and Krumwiede, 2018). Their involvement results in improved production schedules (Khanuja and Jain, 2020). Where stakeholders are not engaged, they adopt practices that are contrary to the firm's objective (Mahapatra *et al.*, 2019).

In addition, SOPs are crucial for firms that wish to integrate their operations (Rajaguru and Matanda, 2019). Ecosystems survive on established SOPs (Liu *et al.*, 2019). These have to be rooted within a firm's business processes (Bhardwaj and Ketokivi, 2020; Rajaguru and Matanda, 2019). They include the firms' routines and rule of the thumb (Tukamuhabwa *et al.*, 2021). These ensure compliance (Ciliberti *et al.*, 2020). From the above discussion, the second hypothesis has been developed.

H2. Inter-firm ecosystem positively influences supply chain integration.

2.3.3 Firm adaptability and supply chain integration. There is limited empirical research on firm adaptability. The focus has been on supply chain resilience using the triple-A (Sheel and Nath,

2019; Lee, 2004). Globalization has made supply chains complex and this has increased pressure on firms. This calls for adaptive strategies to coordinate processes (Jambulingam and Kathuria, 2020; Garrido-Vega *et al.*, 2021). To study firm adaptability, learning and flexibility will be utilized.

Learning is one of the adaptive strategies devised to swiftly respond to changes in uncertain conditions (Lee *et al.*, 2019). It varies across stages and so is integration across trading partners (Scholten *et al.*, 2019). It is a critical driver for information sharing and as firms learn from each other, they quickly meet the market demand (Lisi *et al.*, 2019). This prevents disruptions from occurring (Chen *et al.*, 2021). However, external integration is only possible where firms learn, collaborate and share knowledge (Kumar *et al.*, 2020).

Furthermore, uncertainties in today's supply chains call for flexible strategies (Ivanov, 2021). This allows firms to easily respond to market pressures fostering collaboration and sharing of information (Despoudi *et al.*, 2018). Mutebi *et al.* (2020) also found that participating firms find it easy to change and adjust to the market conditions. This discussion has given rise to the third hypothesis as reflected below.

H3. Firm adaptability positively influences supply chain integration.

2.3.4 Asset specificity and firm adaptability. In situations of uncertainty, firms embrace adaptive strategies to reduce transaction costs (Jambulingam and Kathuria, 2020). They invest in specific assets that enhance learning (Hernández-Espallardo *et al.*, 2010). Through social interaction, assets improve learning resulting in change by all members in the network (Chen and Garg, 2017).

Human capital and learning act as a link to the information in the market (Liu, 2017). Where individuals have the required skills and expertise, they identify problems, errors and suggest solutions (Palacios *et al.*, 2014). Such expertise must be trained and encouraged to socialize with other external actors to enhance learning (Liu, 2017).

Individuals respond to changes in the internal and external environments of business operations by investing in technology to enhance production and quantity mix (Shukor *et al.*, 2021). During the COVID-19 pandemic, firms with stronger digital infrastructure fared better than those without (Gu *et al.*, 2020).

The location of a firm and its trading actors also has an impact on the level of learning (Chen *et al.*, 2021). Accordingly, when firms are located near each other, they learn from the network. The hypothesis below has been derived from the above discussion.

H4. Asset specificity and firm adaptability are positively related.

2.3.5 Inter-firm ecosystem and firm adaptability. Supply chains with more trading partners have been found to be adaptive because of the existence of many players with varying strategies and ability to learn from one another (Garrido-Vega *et al.*, 2021). A highly dense network is a sign that the ecosystem firms are adaptive and flexible to each other (Statsenko *et al.*, 2018; Adner, 2017). The existence of the firm's routine policies and processes allows individuals to learn new ways of doing business (Silvestre *et al.*, 2020).

Stakeholder involvement is a prerequisite for learning to take place. Stakeholders learn through interaction, sharing experiences and collaborating creating a sense of certainty (Scholten *et al.*, 2019). It has also been found to be a source of flexibility given its ability to enhance coordination and improve access to market information (Khanuja and Jain, 2020). During such interface engagements, new ideas are shared (Ramirez-Portilla *et al.*, 2017). Xiao *et al.* (2019) and Khanuja and Jain (2020) posit that synchronization of data and access to customers' real sales data are possible with partner involvement. On the contrary, Singh and Rao (2016) advance that learning is an outcome of interaction between firms.

Mandal *et al.* (2017) encourages firms to develop flexible actions and policies to allow synchronization and exchange of information related to product delivery, forecast and inventory status. This influences compliance with acceptable measures and reduces opportunism (Yunus and Tadisina, 2016). This discussion has led to the development of the hypothesis below.

H5. Inter-firm ecosystem positively influences firm adaptability.

2.3.6 *The mediating role of firm adaptability on the relationship between asset specificity and supply chain integration.* Firms have invested in rare assets and this has put them in an adaptive position by analyzing the supply chain opportunities (Aslam *et al.*, 2018). Investing in specific assets as well as SCI have been found to be strategic decisions in the firm's operation (Kumar *et al.*, 2020).

Technologies needed for integration are always evolving and the ease of integrating the different supply chain partners depends on how easily and fast the players manage this transition (Wang and Wei, 2007). Investment makes firms adaptive by improving on communication and also attaining product modification (Aslam *et al.*, 2018; Sheel and Nath, 2019).

Employees with the right skills and competences are vital in enabling technological usage to make adjustments. This allows real-time sharing of information-across the entire supply chain (Turkulainen *et al.*, 2017; Gawankar *et al.*, 2019). It further improves learning and later influences integration (Sheel and Nath, 2019).

Furthermore, when trading partners are located very far from each other, the pressure to adapt and cope up with the changing market conditions is high (Jean *et al.*, 2021). Jean *et al.* (2021) further reveal that firms can employ IT systems to make firms more adaptive to the changes in the market. The above discussion has given rise to the hypothesis below.

H6. Firm adaptability mediates the relationship between asset specificity and SCI.

2.3.7 *The mediating role of firm adaptability on the relationship between inter-firm ecosystem and supply chain integration.* Inter-firm ecosystem has been found to be successful where members are willing to align their visions and develop a high level of commitment to the norms of the ecosystem (Letaifa, 2014). The success of aligning the firm's policies and procedures with those of its trading partners is embedded in members' flexibility to adjust and accommodate changes (Mutebi *et al.*, 2020).

Developing and adopting shared cultures and norms across firms is critical in making firms adaptive (Shahzad *et al.*, 2017). Through firm adaptability, individuals learn the different policies of the different firms in the ecosystem making them able to align interests and be committed to their success (Selviaridis and Spring, 2018).

It is further believed that involving partners into the firm's operations results in a better view of the overall operations of the firm through shared information (Xiao *et al.*, 2019). In addition, firms tap into the resources and capabilities of the external partners especially where players are flexible and willing to learn and adjust from the routine. Khanuja and Jain (2020) reveal that stakeholder involvements allow firms to be flexible by sharing real-time information on volume, mix and velocity. The hypothesis discussed further in the text has been developed from the above discussion.

H7. Firm adaptability mediates the relationship between inter-firm ecosystem and SCI.

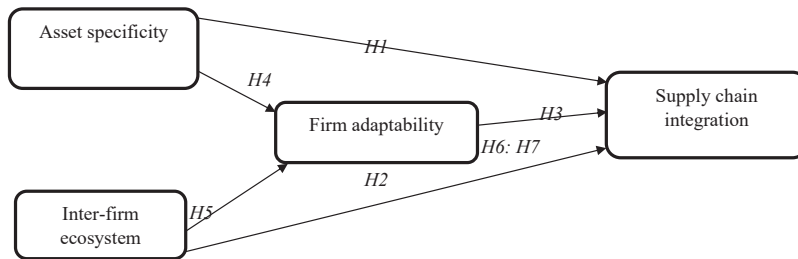
The above hypotheses are illustrated in Figure 1.

3. Methodology

This section looks at the research design, study population, sample size, instrument development and data collection and data analysis.

3.1 Research design

The study used a quantitative research methodology as used by previous scholars (Ganbold *et al.*, 2020; Shukor *et al.*, 2021). This research adopted a quantitative methodology using hypothesis testing. A cross-sectional research design was adopted. Given the nature of the FPS, firms were stratified depending on the categories of products they produce.



Source(s): Williamson (1985), Goldstein *et al.* (2010), Selviaridis and Spring (2018), Chenini *et al.* (2020) and Marshall *et al.* (2021)

Figure 1. Conceptual framework

3.2 Study population and sample

Using data from Uganda National Bureau of Statistics (UBOS), a population of 345 food processing firms found in Kampala District was taken. Using Krejcie and Morgan (1970) table of sample size determination, a statistical sample of 186 firms was arrived at. However, following recommendation Ganbold *et al.* (2020) and Goodhue *et al.* (2012), a sample of 103 firms was sufficient and fair for analysis. The unit of analysis was a firm. This study is anchored on the recommendations by Barratt and Barratt (2011). The researchers recommended that a study on several organizations at different levels of development and economies of scale be conducted. Data was therefore collected from various FPFs with two respondents selected per firm giving a total of 206 responses. A disproportionate stratified simple random sampling technique was used to choose the firms for inclusion in the study. This is because the FPS are in different categories dealing in different activities like Fish and Meat processing (28), manufacturers of bakery products (104), vegetable and animal oil processing (5), manufacture of animal feeds (30), processing and preserving of fruit and vegetables (12), dairy processing (14), grain milling (128) and coffee and tea processing (24) based on the UBOS statistics (2011). Different strata were developed and later applied simple random sampling in selecting the desired sample from each stratum.

The target respondents were managers given their strategic role in the firm’s supply chain operations. These are believed to have the required knowledge on both the firms external and internal operations (Cresswell and Clark, 2011; Palinkas *et al.*, 2015).

3.3 Instrument development and data collection

The instrument had items that covered variables like asset specificity, inter-firm ecosystem, firm adaptability and SCI. These were measured on a 6-point Likert scale with verbal anchors ranging from very untrue (1)–extremely true (6). To achieve content validity, items from previous scholars were adopted with modification. To ensure anonymity and confidentiality of respondents, the questionnaire was designed in a way that there was no space for filling in respondent’s details like name.

SCI was measured using internal integration and external integration (supplier integration and customer integration) despite controversies in literature on the measures (Khanuja and Jain, 2020). Internal integration was measured using six items: three items were from the works of Wong *et al.* (2011), two items from Delic *et al.* (2019) and one item was from Barratt and Barratt (2011). External integration was studied using ten items: three items from the works of Wong *et al.* (2011), three items from Ataseven *et al.* (2020) while four items were adopted from the works of Kanyoma *et al.* (2018).

Asset specificity was measured by human specificity, location specificity, dedicated specificity (Wang *et al.*, 2019; Anderson and Weitz, 1992).

Firm adaptability was measured by learning and flexibility. Learning was studied using twelve items: two were from the works of Prieto-Pastor *et al.* (2018), five were from Guo *et al.* (2020), four were from Kumar *et al.* (2020) and one from Bouncken and Fredrich (2015). Flexibility was measured by six items: three were from Ding *et al.* (2012) while the other three were from Kumar *et al.* (2020).

Inter-firm ecosystem was measured by interdependence, stakeholder involvement and SOPs. Interdependence was measured by 12 items: four items were from Shahzad *et al.* (2017) three were from the works of Bongomin *et al.* (2018) while five were developed from the works of Kembro and Selviaridis (2015). Stakeholder involvement was measured by nine items: four were from the works of Cheng *et al.* (2018) with the rest being obtained from literature review (Cozzolino *et al.*, 2017). SOP was measured by thirteen items. Out of the thirteen items, six were from Prieto-Pastor *et al.* (2018) while seven were from Mutebi *et al.* (2020).

Hard copies of structured questionnaires were physically delivered to every identified firm. After a week, respondents were followed up through telephone calls to inquire if they had any challenge in answering the questions or had completed the questionnaire. Completed questionnaires were then picked for further management. Respondent and firm anonymity were maintained to reduce the social desirability bias and also non-response to certain questions.

3.4 Data analysis

Despite the existence of other versions of SmartPLS-SEM, the study used SmartPLS-SEM version 3.0 for data modeling because it was accessible to the researchers and could be used to obtain the required results. SPSS version 21 was used to test for firm and respondent characteristics, normality, skewness, kurtosis and reliability. Smart PLS was used to test for Variance Inflation Factor (VIF), Average Variance Extracted (AVE), Confirmatory Factor Analysis (CFA) and structural model results. CFA revealed that all measurement items were significantly associated with the variables they measured (Table 1).

3.5 Confirmatory factor analysis

Based on our scale, all respondents agreed that the items were a true representation of what was happening in their organizations given our mean values (see Table 1). A formative-reflective model was used to measure the constructs and their indicative items.

On SCI, respondents were meant to reveal whether their organizations were coordinating and sharing information about their supply chain processes both internally and externally with

Table 1. Bootstrapped path coefficients for all construct variables

Path	B	p-values	Mean
External Integration → SCI	0.609	0.000	4.633
Internal Integration → SCI	0.528	0.000	4.649
<i>Asset specificity</i>			
Dedicated Specificity → Asset specificity	0.611	0.000	4.608
Human specificity → Asset specificity	0.204	0.000	4.714
Location Specificity → Asset specificity	0.391	0.000	4.396
Interdependence → Inter-Firm Ecosystem	0.351	0.000	4.511
Stakeholder Involvement → Inter-Firm Ecosystem	0.424	0.000	4.518
SOP → Inter-Firm Ecosystem	0.431	0.000	4.803
Flexibility → Firm Adaptability	0.569	0.000	4.324
Learning → Firm Adaptability	0.476	0.000	4.629

Source(s): Authors' own creation

suppliers and key customers. Out of the nine items that measured external integration, eight were retained with loadings between 0.478 and 0.631 ($\beta = 0.609$; $p = 0.000$) while all the six items that measured internal integration were retained with 0.487–0.778 and $\beta = 0.528$; $p = 0.000$. Following recommendations by Hair *et al.* (1995), indicators of 0.4 and above should only be deleted if it will improve composite reliability or AVE. This implies that all constructs were significant to SCI. However, the success of SCI depends more on external integration capabilities as revealed by earlier scholars like Kanyoma *et al.* (2020) and Ataseven *et al.* (2020).

Asset specificity with its measures aimed at examining the level of investment in customized facilities by the firms to foster adaptability in uncertain situations and to also promote SCI. The measures of asset specificity were dedicated specificity, human specificity and location specificity. Dedicated specificity had eight items all loading between 0.506 and 0.816 with $\beta = 0.611$; $p = 0.000$. Human specificity had six items and all were retained loading between 0.476 and 0.751 with $\beta = 0.204$; $p = 0.000$. Lastly, location specificity measured how far or near the firms located their facilities in the market. Five items were used to study location specificity. All items were retained with loadings between 0.656 and 0.808 and $\beta = 0.391$; $p = 0.000$. These findings indicate that FPFs are more focused at investing in dedicated facilities and locating them near the market (suppliers and customers) to achieve frequent sharing of information and quick response to market pressures than investing in improving the skills and competencies of their human resource.

Inter-firm ecosystem measures were interdependence, standard operating procedures and stakeholder involvement. Interdependence had twelve items. Eight items were retained with loadings between 0.512 and 0.765 while four items were dropped because they loaded below 0.4. According to Hair *et al.* (2017), items with outer loadings below 0.4 should be removed due to their effect on content validity. Standard operating procedure had nine items out of which, two were dropped because they loaded below 0.4 while seven were retained with loadings between 0.629 and 0.809. Lastly, stakeholder involvement was measured using eight items out of which six were retained with loadings between 0.409 and 0.741. In addition, of all the inter-firm ecosystem measures, respondents contended that firms embraced SOP (mean = 4.8) while dealing with their suppliers and customers more than the rest of the constructs (Table 1). Though all measures were significant, still SOP was found to be a better measure of inter-firm ecosystem than the other two factors. Therefore, in uncertain situations FPFs embrace their routines, they stick to the rules of the game, goals and objectives.

Firm adaptability aimed at investigating whether in uncertain situations FPFs adopted learning and flexibility strategies. It was found that firms adopted learning as an adaptive strategy more than flexibility (mean = 4.629). Learning items were ten but only six were retained with loadings between 0.483 and 0.633 while the six items that measured flexibility were retained with loadings between 0.609 and 0.740. Therefore, flexibility was found to be a better measure of firm adaptability ($\beta = 0.569$; $p = 0.000$).

4. Descriptive statistics

Preliminary data was analyzed using SPSS version 21. As reflected on Table 2, the bakery sub-sector accounted for the highest composition of the sector (32.7%), followed by grain milling (31.2%), with the least falling under processing and preserving of fruit and vegetables (2.3%). This means that this study is informed by data from the bakery sub-sector and the grain milling sub-sector. This is consistent with NDPII report (2020) which found that grain milling is one of the largest sub-sector of the food processing industry in Uganda.

The number of employees was used to determine the size of the firm. Medium-sized firms employing between 51 and 100 people accounted for 160 (60.8%), followed by small-sized firms that employ between 5 and 50 (33.5%). This implies that small and medium firms are the biggest employers. Most firms were found to have been in business between 6 and 10 years (63.1%) followed by those between 1 and 5 years (25.7%). The analysis of respondent profiles

Table 2. Organization and respondent profile

<i>Business category</i>	Freq	Percent	<i>Workforce size</i>	<i>Freq</i>	<i>Percent</i>
Fish and meat processing	20	7.6	5–50	88	33.5
Manufacturers of Bakery products	86	32.7	51–100	160	60.8
Vegetable and animal oil processing	9	3.4	100 and more	15	5.7
Processing and preserving of fruit and vegetables	6	2.3	Total	263	100.0
Dairy Processing	16	6.1	<i>Years of existence</i>	<i>Frequency</i>	<i>Percent</i>
Grain milling	82	31.2	1–5 years	45	17.1
Coffee and tea processing	29	11.0	6–10 years	181	68.8
Animal Feeds	15	5.7	Over 10 years	37	14.1
Total	263	100.0	Total	263	100.0

<i>Age category</i>	Freq	Percent	<i>Period worked</i>	Freq	Percent
<i>Respondent characteristics</i>					
20–32	49	18.6	Less than 1 year	19	7.2
33–48	125	47.5	2–3 years	118	44.7
49–67	85	32.3	4–5 years	103	39.0
68 years and above	4	1.5	6 years and above	23	8.7
Total	263	100.0	Total	263	99.6

Source(s): Authors' own creation

revealed that most respondents were within the age bracket of 33–48 years (47.5%) with the least being those of 68 years and above (1.5%). This implies that the sector requires more energetic people and given the nature of operations, most people leave the sector as they advance in age. Most respondents had also worked with the firm for a period between 2 and 3 years (44.7%) which further indicates that as people join the sector, they leave to join other sub-sectors.

To determine the reliability, convergent and discriminant validity of the measurement items and the study variables was conducted. Convergent reliability was tested using Cronbach alpha and composite reliability (see Table 3). For both tests, the values were above 0.7 indicating that the data was reliable as advanced by Alam *et al.* (2014). AVE values were above 0.5 confirming the presence of convergent validity (Rajaguru and Matanda, 2019).

Discriminant validity (see Table 4) was measured using the heterotrait–monotrait method. All the values were below the set threshold of 0.9 (Namagembe, 2020). Data was also tested for normality and the first test was skewness and Kurtosis (see Table 3). Our data was in line with

Table 3. Table showing normality test, average variance extracted, composite reliability and Variance Inflation Factor

<i>N = 263 firms</i>	Skewness	Std. Error	Kurtosis	Std. Error	AVE	Composite reliability	VIF	Cronbach alpha
Asset specificity	–0.280	0.238	–0.384	0.472	0.680	0.815	1.539	0.803
Firm adaptability	–0.424	0.238	0.428	0.472	0.645	0.786	1.600	0.769
Inter-firm ecosystem	–0.821	0.238	1.012	0.472	0.652	0.876	1.557	0.869
SCI	–0.459	0.238	1.032	0.472	0.592	0.758	1.383	0.755

Source(s): Authors' own creation

Table 4. Heterotrait-Monotrait (HTMT) ratio results for the constructs

Variables	1	2	3	4
Asset specificity-1	0.825			
Inter-firm ecosystem-2	0.726**	0.807		
Firm adaptability-3	0.632**	0.626**	0.803	
Supply chain integration-4	0.493**	0.520**	0.705**	0.592

Note(s): $N = 263$; **Correlation is significant at the 0.01 level (2-tailed)
Source(s): Analysis of quantitative data

Namagembe (2020) who revealed that the skewness values of less than 2 and kurtosis values of less than 7 shows that the data is normal hence normality of data was established. Further, there was no evidence of multicollinearity between the variables because the Variance Inflation Factor (VIF) values were less than 5 (Table 3).

5. Findings and hypothesis testing

Our structural model results are provided in Table 5. The model was designed to test the relationship between the latent variables of the study using PLS-SEM following model criteria by Hair et al. (2017). From the literature search, the study anticipated the independent variables to have a positive effect on the dependent variable. From analysis (Figure 2), it was found that asset specificity and inter-firm ecosystem had a positive but insignificant effect on SCI ($\beta = 0.016$; $p < 0.804$; $\beta = 0.094$; $p < 0.201$) respectively which implies that H1 and H2 was not supported. Firm adaptability had a positive significant effect on SCI ($\beta = 0.537$; $p < 0.000$) giving support to H3. Also, all independent variables asset specificity and inter-firm ecosystem are associated positively with the mediator variable giving support to H6 and H7. Following Barron and Kenny’s four-stage procedure, a mediation test was carried out (Baron and Kenny, 1986). Accordingly, the following were done: 1. The independent variables were regressed on the mediator variable, step 2 involved regressing the mediator variable (firm adaptability) on the dependent variable. Thirdly, independent variables were then regressed on the dependent variable. Lastly, mediation analysis was conducted with all the variables involved in the analysis. From that analysis, all paths were found significant implying that firm adaptability mediated the relationships as per the model. The results from the mediation analysis were as follow; a partial mediation was established between asset specificity and SCI since the influence of asset specificity on SCI was found significant ($\beta = 0.341$; p -value = 0.004) while a full mediation effect was found in inter-firm ecosystem and SCI since its influence ceased with the introduction of a mediator ($\beta = 0.114$; p -value = 0.237).

6. Discussion of research findings

The section provides the findings on the effect of asset specificity and inter-firm ecosystem on SCI mediated by firm adaptability.

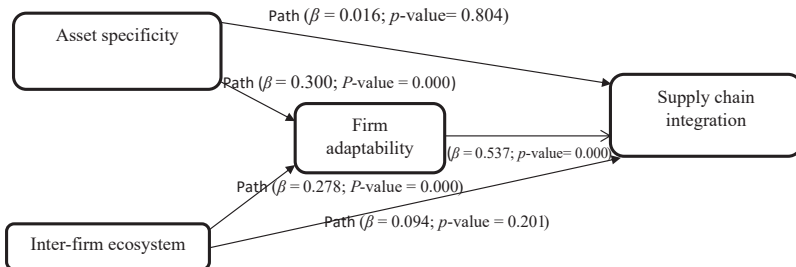
6.1 Direct effects

Hypothesis 1 provides an exciting theoretical opportunity for the application of TCT in studying SCI contrary to Farida et al. (2024). The current study found that asset specificity had a positive effect on SCI though not significant ($\beta = 0.016$; p -value = 0.804) which contradicts with Farida et al. (2024) who found positive significant results. The current findings also vary with those of Farida et al. (2024) in the level of influence ($\beta = 0.365$; p -value = 0.003). This could be attributed to the introduction of the inter-firm ecosystem variable in the model. Comparing the two studies, we note that in the current study, when inter-firm ecosystem

Table 5. Standardized regression estimates for direct hypothesized path

	β	μ	$S > D$	T-value	p-values	Bca	Decision
<i>Direct effect</i>							
Asset Specificity → Firm Adaptability	0.300	0.294	0.060	4.939	0.000	[0.182; 0.413]	Supported
Asset Specificity → Supply chain Integration	0.016	-0.011	0.063	0.179	0.804	[-0.136; 0.114]	Not supported
Firm Adaptability → Supply chain Integration	0.537	0.628	0.057	11.037	0.000	[0.519; 0.739]	Supported
Inter-firm Ecosystem → Firm Adaptability	0.278	0.296	0.064	4.589	0.000	[0.170; 0.416]	Supported
Inter-firm Ecosystem → Supply chain Integration	0.094	0.072	0.074	0.972	0.201	[-0.073; 0.213]	Not supported
<i>Indirect effect</i>							
Inter-Firm Ecosystem → Firm Adaptability → Supply chain Integration	0.184	0.186	0.044	4.205	0.000	[0.105; 0.277]	Supported
Asset Specificity → Firm Adaptability → Supply chain Integration	0.186	0.185	0.043	4.365	0.000	[0.113; 0.283]	Supported
<i>Total Effect</i>							
Asset Specificity → Firm Adaptability	0.296	0.294	0.060	4.939	0.000	[0.182; 0.413]	Supported
Asset Specificity → Supply chain Integration	0.175	0.174	0.073	2.404	0.016	[0.029; 0.317]	Supported
Inter-Firm Adaptability → Supply chain Integration	0.629	0.628	0.057	11.037	0.000	[0.519; 0.739]	Not supported
Inter-firm Ecosystem → Firm Adaptability	0.293	0.296	0.064	4.589	0.000	[0.170; 0.416]	Supported
Inter-firm Ecosystem → Supply chain Integration	0.256	0.258	0.083	3.075	0.002	[0.093; 0.421]	Supported

Note(s): T-value is significant >1.65 (10%), >1.96 (5%), >2.57 (1%)
Source(s): PLS-SEM



Source(s): Authors' own elaboration

Figure 2. Structural model

factors are increased, firms would reduce investment in specific assets causing its effect on SCI to further go down. This is in line with [Bygballe et al. \(2023\)](#) who found that dependence reduces investment in specific assets since it promotes sharing of scarce resources. Also, [Tseng et al. \(2023\)](#) found that it was not the location of the firm that influenced their investment in specific assets but rather the level of partner involvement.

Our findings, however, imply that though FPFs have invested in specific assets like locating firms near the market to achieve coordination and quick response to the market, the objective has partially been achieved. From TCT, this indicates that firms are still incurring high costs to monitor and coordinate supply chain operations with trading partners ([Williamson, 1985](#)). This is contrary to [Akidi et al. \(2022\)](#) who found that partners conveniently integrate their operations with firms that are located within their vicinity to reduce transactional costs. They also achieve sharing of market information through face-to-face meetings ([Balland et al., 2015](#)). The high costs could also be due to high switching costs resulting from having multiple partners. [Kataike \(2019\)](#) in the study that focused on the dairy sector in Uganda using the TCT revealed that farmers maintained multi-level relationships with many dairy firms which increased the cost of monitoring and coordination.

In line with the findings, [Garces Rivera and Pfeiffer \(2018\)](#) found that partners were still incurring extra costs transporting coffee beans to the market. In addition, the pig sub-sector is suffering from poor warehousing facilities, especially in the upstream supply chain and the sector has been sidelined for a long time ([Ouma et al., 2016](#)). [Abdulsamad and Gereffi \(2016\)](#) also found little investment in cold chains as some processors continue to deliver pasteurized milk in non-refrigerated trucks.

Some firms have made investments in standardized warehouses, technology and transport facilities to coordinate inventory levels. However, these efforts have not resulted in sharing of information. This implies that much as investment in specific resources has been made, they are either still low or not appropriate to foster coordination and sharing of information. Therefore, players need to rethink their investment decisions. This is consistent with [Kataike \(2019\)](#) who revealed that much as dairy firms have made investments in milk cooling tanks, milk cans and road tankers, they are not enough.

Previous scholars revealed that investment in human resources results in better working relationships ([Huo et al., 2014](#)). Coffee farmers have also received training on coffee stem quality ([Garces Rivera and Pfeiffer, 2018](#)). However, there are still contradictions across industries. [Lakuma et al. \(2021\)](#) in the ERPC report revealed that there were limited personnel in the fish processing sector to manage the value chain and called upon Uganda National Bureau of Standards to train persons to cover the gaps. Low levels of education among Community Animal Health Workers (CAHW) in the piggery sector (meat processing) limit sharing of information related to drug usage and type ([Ouma et al., 2016](#)). These findings are in line with $\beta = 0.204$; p -value = 0.000 for human specificity. This implies that much as firms have made investment in specific assets, the influence of human specificity still remains low.

In line with the TCT, this study assumes that investment in specific assets results in integration. The TCT assumes that vertical integration is possible and successful where firms invest in specific assets that act as hostages to reduce the cost of transactions. However, the existence of opportunism among the players limits investment ([Williamson, 1985](#)). Therefore, much as under this hypothesis the objective to invest in specific assets has not been successfully achieved, in uncertain situations, firms are in a position to survive and also share information as reflected in H4 and H6. This explains critical role of the mediation variable.

Hypothesis 2 contradicts the CAST assumption that ecosystems survive by sharing resources through symbiotic interactions ([Goldstein et al., 2010](#)). It also contradicts [Statsenko et al. \(2018\)](#) who advanced that in an ecosystem where partners are connected, it fosters sharing of information. Our results reveal that inter-firm ecosystem and SCI were insignificantly related ($\beta = 0.094$; p -value = 0.201) implying that players in the FPS are independent of each other in accomplishing tasks, they don't fully involve trading partners and have also not fully embraced the use of standard operating procedures. It could therefore imply

that these firms are only embracing ecosystem factors under uncertain situations as explained in H5 and H7. This hinders sharing of operational and strategic information and joint inventory planning. This explains why firms have resorted to informal sources of input supply (World Bank, 2018).

The dairy sector is fragmented with independent transporters and local traders who collect milk from farmers creating insufficient milk and under-capacity utilization in the formal sector. It's believed that suppliers/farmers prefer dealing with the informal players because they offer better prices compared to processors limiting coordination (Abdulsamad and Gereffi, 2016).

The reason for the low levels of interdependence can be explained by Selviaridis and Spring (2018). Accordingly, interdependence and sharing information may not be possible where firms are at different levels of production in terms of size. The existence of opportunism noted in our results also compromises interdependence limiting sharing of information (Kanyoma et al., 2018).

In line with Obwona et al. (2014), our findings revealed limited use of websites, emails and social media platforms like WhatsApp and Facebook to communicate and share information with trading partners. The results also revealed the absence of common goals, vision and objectives. This is contrary to previous studies that advanced that having a shared vision determines the survival and the nature of relationships in an ecosystem (van Dijk et al., 2021). Absence of a shared vision results in compromising the industry standards. In the piggery sector, there is limited adherence to standards and this limits integration (Ouma et al., 2016).

There is limited adherence to the available standards in the fish sector and this affects alignment of processes from the suppliers end to customers end (Lakuma et al., 2020). Waiswa et al. (2021) recommends that dairy farmers need to revise existing policies. Where Memorandum of Understanding (SOPs) have been adopted, there have been complaints about the services provided (Joughin, 2019). Consistent with our finding, most firms in our study did not belong to an ecosystem (association) (Makoni et al., 2014; Waiswa et al., 2021). This limits supply chain visibility and results in forecast errors.

We also note and confirm Rajaguru and Matanda's (2019) finding that failure to align interests, vision and goals in an ecosystem though there exist rules and policies may not result in integration with partners.

On partner involvement, the results found that firms had limited involvement of their trading partners in supply chain masters. These were never consulted whenever adjustments in prices and orders were made. This is consistent with Tumushabe (2020). Accordingly, dairy farmers have no say on the price of milk. Of all the processors in the dairy sector, it is only JESA that offers fixed prices to its suppliers for a period of one year (Toye, 2012). Mahapatra et al. (2019) noted that when partners are not involved in ecosystem activities, they adopt practices that are contrary to the firm's objective.

Controversies in our results could be due to role ambiguity and the many players that are involved in the ecosystem limiting information sharing (Waiswa et al., 2021; Garcés Rivera and Pfeiffer, 2018). Garcés Rivera and Pfeiffer (2018) contend that role clarity is the cornerstone for better relationships.

Hypothesis 3 results unveiled a significant relationship between firm adaptability and SCI ($\beta = 0.537$; p -value = 0.000). This is in line with the findings by Farida et al. (2024) with ($\beta = 0.321$; p -value = 0.004) under the same context. However, in the current study, the adaptability levels of firms are improving and this could be attributed to the existence of inter-firm ecosystem factors. The study finds that in uncertain situations, supply chain partners change their attitude towards market situations by changing inventory management practices based on the knowledge acquired through interactions. They connect processes, share inventory status information to allow quick response to market needs.

Our study finds support and contradictions in existing literature. Lisi et al. (2019) posit that as firms interact in uncertain situations, they learn how to respond to the market dynamics. However, some scholars posit that integration influences learning (Silvestre et al., 2020).

Furthermore, firms make adjustments in production schedules to accommodate changes from both suppliers and customers in uncertain markets. This enhances the coordination of inventory schedules throughout the entire supply chain. Mutebi *et al.* (2020) contend that the ability to adjust to the market pressure allows firms to coordinate and share market information. The findings further reveal that in uncertain situations, supply chain actors learn from their mistakes and adopt new skills, and knowledge on how to manage supply chain operations like order processing and deliveries to customers. This helps firms to prevent disruptions in the supply chain (Chen *et al.*, 2021).

However, H3 contradicts with Garrido-Vega *et al.* (2021) who found that in a complex and uncertain environment, firms find it difficult to adapt due to information asymmetry.

Hypothesis 4's findings reveal a positive association between asset specificity and firm adaptability ($\beta = 0.300$; p -value = 0.000) which is in line with Farida *et al.* (2024). However, in their study the influence of asset specificity on firm adaptability was ($\beta = 0.416$; p -value = 0.000) a bit higher than in the current study. A lower influence in the current study could be attributed to the introduction of inter-firm ecosystem factors more so standard operating procedures ($\beta = 0.431$; p -value = 0.000). The more firms engage in meetings as a routine, the more they don't invest in specific assets because they understand the challenges involved and therefore reduce investment (AlHares *et al.*, 2018).

The current findings imply that in uncertain situations, firms envisage an increase in the cost of trading partners and invest in adaptive assets. However firms are investing more in human specificity (mean = 4.714) and dedicated specificity (mean = 4.714) to be adaptive than in location specificity (mean = 4.396). Investment in dedicated assets enables firms to stock enough inventories, and quickly make adjustments to respond to market demand. Our findings are consistent Waiswa *et al.* (2021) who recommended establishment of rural milk collection and cooling infrastructure to increase proper storage of milk. Our findings however contradict with Obwona *et al.* (2014) who found limited investment in technology limiting adaptability levels.

Investments have been in human skills in the coffee industry making farmers adaptive (Garces Rivera and Pfeiffer, 2018). JESA has also been noted to train its dairy suppliers (Toye, 2012). Training imparts skills that allow partners to change their strategies based on the market conditions (Liu, 2017). Contrary to our mean = 4.714 for human specificity, some scholars have noted inadequate skills in the manufacturing sector (Uganda Bureau of Statistics, 2011/2012; Obwona *et al.*, 2014).

This study further finds that some players are located close to the market and are therefore spending minimal costs and time transporting raw materials and finished stock which is consistent with Farida *et al.* (2024). In Uganda, some processors in the dairy sector have invested in milk collection centres acting as coordination centres (Abdulsamad and Gereffi, 2016). This enhances the ability to adjust production and delivery schedules to customers.

On the contrary, most processors in Uganda are located far from their suppliers and this increases transaction costs (Garces Rivera and Pfeiffer, 2018). Despite such inconsistencies, our findings are backed up by some scholars. Chen *et al.* (2021) posit that the location of a firm is vital in the learning process. Based on our study, this is due to continuous interactions and knowledge exchanges that take place.

Hypothesis 5 findings show a significant relationship between inter-firm ecosystem and firm adaptability ($\beta = 0.278$; p -value = 0.000). This is consistent with our theoretical foundation that ecosystems are complex webs with many actors who depend on each other in uncertain situations to evolve (Goldstein *et al.*, 2010). They adopt the same working norms and communicate with partners via social network platforms as well as holding physical meetings to agree on price changes (mean = 4.803). The use of both media platforms and meetings was supported by Barratt and Barratt (2011) and Ganbold *et al.* (2020). The findings reveal that there is interdependence among firms (mean = 4.511). This is in line with Garces Rivera and Pfeiffer (2018) and Goldstein *et al.* (2010) who found that interdependence is the source of survival in an ecosystem. This reduces opportunism as firms embrace shared objectives (Kanyoma *et al.*, 2018; Goldstein *et al.*, 2010).

Furthermore, ecosystem partners learn from experiences shared during meetings and via social media platforms enhancing their ability to adjust their attitude towards supply chain operations. It is believed that involving external players in market analysis puts firms in a better position to quickly adjust their schedules in response to market needs. These findings resonate with [Scholten et al. \(2019\)](#) who posited that as firms interact, they learn from experiences and create a sense of certainty in their operations. Also [AlHares et al. \(2018\)](#) posit that better decisions are made after meetings.

In addition, FPFs have to understand that though suppliers are not “the spider in the web” connecting all players in the supply chain, they determine the success of the ecosystem ([Garces Rivera and Pfeiffer, 2018](#)). Despite that, coffee farmers have been sidelined and their involvement has been limited to the early stages of coffee farming. This hypothesis could be as a result of the many players in the sector ([Waiswa et al., 2021](#); [Goldstein et al., 2010](#)). The more the trading partners, the more adaptive the players as they share strategies ([Garrido-Vega et al., 2021](#); [Goldstein et al., 2010](#)).

6.2 Mediation effects

Hypothesis 6 shows a significant and positive influence ($\beta = 0.186$; p -value = 0.000). Accordingly, though asset specificity has a positive influence on SCI ($\beta = 0.016$; p -value = 0.804), its impact is made significant through firm adaptability which implies that a partial mediation was established. The findings reveal that though asset specificity increases transaction costs and limits sharing of information and other resources, in uncertain situations, firms have no option but to invest in specific assets and work with their external partners. They also take advantage of their already existing resources to remain adaptive to the market and get the necessary market information. According to [Bhardwaj and Ketokivi \(2020\)](#) and [Palacios et al. \(2014\)](#) such adaptive skills and competencies put a firm in a better position to solve the day-to-day market challenges. [Akidi et al. \(2022\)](#) posit that training reduces partner bias allowing sharing of information.

In addition, the results reveal that asset specificity impacts SCI by improving coordination, monitoring of inventory through their trained staffs and being able to swiftly adjust processes to meet the market needs. These assets put firms in an adaptive position as they critically analyze the supply chain opportunities ([Aslam et al., 2018](#)). Furthermore, they make supply chains flexible ([Wang and Wei, 2007](#)). Being flexible, allows sharing of information ([Despoudi et al., 2018](#)). During training between JESA and its suppliers, there is a lot of interaction that takes place ([Toye, 2012](#)).

Hypothesis 7 findings revealed the existence of a full mediation of firm adaptability on the effect of inter-firm ecosystem on SCI ($\beta = 0.184$; p -value = 0.000). This implies that for inter-firm ecosystem to have an influence on supply chain integration, it has to be through firm adaptability especially in uncertain situations. These results reveal that firms are making efforts to involve external partners in most of the supply chain activities, encouraging them to belong to associations, putting in place policies and standards and creating an environment where support is given to them in case of any challenge to improve interactions and sharing information especially in uncertain situations. [Waiswa et al. \(2021\)](#) believes that policies aimed at reducing the numbers of players in the sector need to be adopted in hard economic times.

7. Theoretical implication, managerial implications and conclusions

The outcomes of this research provide critical insights into the present literature on asset specificity, inter-firm ecosystem and firm adaptability on SCI.

7.1 Theoretical implication

The study contributes to previous scholars of SCI by using the TCT and CAST because few studies have taken SCI to be a complex concept as well as a TCT concept. The study confirms

recommendations by Song and Song (2021) that indeed SCI can be looked at as a TCT concept. Integrating the firms' operations comes with costs and the complexity created by investing in specific assets and bring in new firms can be managed when firms are adaptive. This study is the first to design a model that combines the three independent variables to study supply chain integration.

7.2 Managerial and policy implication

From our findings, we believe managers need to focus on adaptive strategies given the uncertain nature of their operating environment. There is a need for joint collaboration between the players in the sector to increase investment in specific assets and improve capacity utilization. This will reduce supply chain costs and also achieve better forecasts. Managers are warned that developing a strong ecosystem culture where rules, norms and standards exist does not foster SCI probably because it breeds grounds for opportunistic tendencies. Therefore there is need to create an environment where opportunism is minimized and this could be through trust.

To policy, more government efforts are needed to achieve shared outcomes. The FPS contributes to the economy by feeding over 34.9 million to 40.3 million Ugandans. Government needs to come up with policies to ensure that all players in the sector are registered in their ecosystems to ease coordination and extend support to them. This will allow them to share information and achieve production at full capacity to feed the growing population. Government should also come up with fair policies that boost the small and medium firms in the sector because these have been identified to dominate the sector and they employ more people than the large firms. With this strategy, government will be able to address the rampant unemployment in the country.

8. Conclusion

From our results, all direct relationships were positive except the relationship between the inter-firm ecosystem and SCI. This research concludes that there could be other factors that could strengthen our results like creating an environment where trust thrives and reducing opportunism as these build confidence to invest in specific assets. Williamson (2010) found that investing in specific assets requires that firms develop relationships based on trust.

8.1 Areas for future research

Our study comes shortly after the COVID-19 pandemic that may have affected investment in human specificity and dedicated specificity. This requires investigation after economies normalize. During the pandemic, investing in human skills to run the installed systems was necessary. The study found that inter-firm ecosystems could have an influence on investment in the firm's specificity assets. Therefore other scholars could try and investigate this in a similar context. Lastly, this study took a quantitative approach that focused on perceptions, future studies can take a qualitative approach to get deeper insights into the factors that impede ecosystems from thriving in the FPS. There is a need to get a deeper understanding of why the level of investment in specific assets remains low in the FPS. SCI is identified as a behavioral variable that needs more time to be studied meaning that a longitudinal study must have been the most appropriate. Thus, a longitudinal survey may be used to examine the impact of the independent variables on SCI.

References

- Abbasi, M. and Varga, L. (2021), "Steering supply chains from a complex systems perspective", *European Journal of Management Studies*, Vol. 27 No. 1, pp. 5-38, doi: [10.1108/EJMS-04-2021-0030](https://doi.org/10.1108/EJMS-04-2021-0030).
- Abdulsamad, A. and Gereffi, G. (2016), "Dairy value chains in East Africa", available at: <https://www.google.com/url?sa5t&rct5j&q5&esrc5s&source5web&cd5&cad5rja&uact58&>

- Adner, R. (2017), "Ecosystem as structure: an actionable construct for strategy", *Journal of Management*, Vol. 43 No. 1, pp. 39-58, doi: [10.1177/0149206316678451](https://doi.org/10.1177/0149206316678451).
- Akidi, I.L., Mshenga, P.M. and Mugonola, B. (2022), "Determinants of governance structure choice among beekeepers in Northern Uganda", *Agricultural Sciences*, Vol. 13, pp. 86-105.
- Alam, A., Bagchi, P.K., Kim, B., Mitra, S. and Seabra, F. (2014), "The mediating effect of logistics integration on supply chain performance", *The International Journal of Logistics Management*, Vol. 25 No. 3, pp. 553-580, doi: [10.1108/ijlm-05-2013-0050](https://doi.org/10.1108/ijlm-05-2013-0050).
- AlHares, A., Ntim, C., Al-Hares, O. and Al Abed, R. (2018), "Frequency of board meetings and R&D investment strategy: evidence from OECD countries", *Theoretical Economics Letters*, Vol. 8 No. 14, pp. 3016-3033, doi: [10.4236/tel.2018.814187](https://doi.org/10.4236/tel.2018.814187).
- Alinaghian, L., Qiu, J. and Razmdoost, K. (2020), "The role of network structural properties in supply chain sustainability: a systematic literature review and agenda for future research", *Supply Chain Management: An International Journal*, Vol. 26 No. 2, pp. 192-211, doi: [10.1108/SCM-11-2019-0407](https://doi.org/10.1108/SCM-11-2019-0407).
- Anderson, E. and Weitz, B. (1992), "The use of pledges to build and sustain commitment in distribution channels", *Journal of Marketing Research*, Vol. 29 No. 1, pp. 18-34, doi: [10.2307/3172490](https://doi.org/10.2307/3172490).
- Aslam, H., Blome, C., Roscoe, S. and Azhar, T.M. (2018), "Dynamic supply chain capabilities: how market sensing, supply chain agility and adaptability affect supply chain ambidexterity", *International Journal of Operations and Production Management*, Vol. 38 No. 12, pp. 2266-2285, doi: [10.1108/ijopm-09-2017-0555](https://doi.org/10.1108/ijopm-09-2017-0555).
- Ataseven, C., Nair, A. and Ferguson, M. (2020), "The role of SCI in strengthening the performance of not-for-profit organizations: evidence from the food banking industry", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 10 No. 2, pp. 101-123, doi: [10.1108/jhlscm-04-2019-0024](https://doi.org/10.1108/jhlscm-04-2019-0024).
- Balland, P.A., Boschma, R. and Frenken, K. (2015), "Proximity and innovation: from statics to dynamics", *Regional Studies*, Vol. 49 No. 6, pp. 907-920, doi: [10.1080/00343404.2014.883598](https://doi.org/10.1080/00343404.2014.883598).
- Baron, R.M. and Kenny, D.A. (1986), "The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, pp. 1173-1182, doi: [10.1037/0022-3514.51.6.1173](https://doi.org/10.1037/0022-3514.51.6.1173).
- Barratt, M. and Barratt, R. (2011), "Exploring internal and external supply chain linkages: evidence from the field", *Journal of Operations Management*, Vol. 29 No. 5, pp. 514-528, doi: [10.1016/j.jom.2010.11.006](https://doi.org/10.1016/j.jom.2010.11.006).
- Bennett, D. and Klug, F. (2012), "Logistics supplier integration in the automotive industry", *International Journal of Operations and Production Management*, Vol. 32 No. 11, pp. 1281-1305.
- Bhardwaj, A. and Ketokivi, M.M. (2020), "Bilateral dependency and supplier performance ambiguity in supply chain contracting: evidence from the railroad industry", *Research Article*, Vol. 67 No. 1, pp. 49-70, doi: [10.1002/joom.1103](https://doi.org/10.1002/joom.1103).
- Bongomin, G.O.C., Munene, J.C., Ntayi, J.M. and Malinga, C.A. (2018), "Social network: testing the predictive power of its dimensions in explaining financial inclusion of the poor in rural Uganda", *African Journal of Economic and Management Studies*, Vol. 9 No. 3, pp. 388-406, doi: [10.1108/ajems-07-2017-0157](https://doi.org/10.1108/ajems-07-2017-0157).
- Bouncken, R.B. and Fredrich, V. (2015), "Learning in cooptation: alliance orientation, network size, and firm types", *Journal of Business Research*, Vol. 69 No. 5, pp. 1753-1758, doi: [10.1016/j.jbusres.2015.10.050](https://doi.org/10.1016/j.jbusres.2015.10.050).
- Burford, N., Shipilov, A.V. and Furr, N. (2021), "How ecosystem structure affects firm performance in response to a negative shock to interdependencies", Vol. 43 No. 1, pp. 30-57, doi: [10.1002/smj.3318](https://doi.org/10.1002/smj.3318).

- Bygballe, L.E., Dubois, A. and Jahre, M. (2023), "The importance of resource interaction in strategies for managing supply chain disruptions", *Journal of Business Research*, Vol. 154, 113333, doi: [10.1016/j.jbusres.2022.113333](https://doi.org/10.1016/j.jbusres.2022.113333).
- Chen, J.S. and Garg, P. (2017), "Dancing with the stars: benefits of a star employee's temporary absence for organizational performance", *Strategic Management Journal*, Vol. 39 No. 5, pp. 1239-1267, doi: [10.1002/smj.2758](https://doi.org/10.1002/smj.2758).
- Chen, K., Li, Y. and Linderman, K. (2021), "Supply network resilience learning: an exploratory data analytics study", *Decision Sciences*, Vol. 53, pp. 1-20, doi: [10.1111/dec.12513](https://doi.org/10.1111/dec.12513).
- Cheng, C.C.J. and Krumwiede, D. (2018), "Enhancing the performance of supplier involvement in new product development: the enabling roles of social media and firm capabilities", *Supply Chain Management: An International Journal*, Vol. 23 No. 3, pp. 171-187, doi: [10.1108/SCM-07-2017-0230](https://doi.org/10.1108/SCM-07-2017-0230).
- Cheng, E.W., Yu, C.W., Sin, L.S. and Ma, C.S. (2018), "Stakeholders' roles in field experience: some empirical evidence", *Journal of Applied Research in Higher Education*, Vol. 10 No. 4, pp. 556-569.
- Christopher, M. (2011), *Logistics and Supply Chain Management*, 4th ed.
- Ciliberti, S., Frascarelli, A. and Martino, G. (2020), "Drivers of participation in collective arrangements in the agri-food supply chain. Evidence from Italy using a transaction costs economics perspective", *Annals of Public and Cooperative Economics*, Vol. 91 No. 3, pp. 1-23, doi: [10.1111/apce.12263](https://doi.org/10.1111/apce.12263), available at: wileyonlinelibrary.com/journal/apce
- Cozzolino, A., Wankowicz, E. and Massaroni, E. (2017), "Logistics service providers' engagement in disaster relief initiatives: an exploratory analysis", *International Journal of Quality and Service Sciences*, Vol. 9 Nos 3/4, pp. 269-291, doi: [10.1108/IJQSS-04-2017-0040](https://doi.org/10.1108/IJQSS-04-2017-0040).
- Cresswell, J.W. and Clark, V.L.P. (2011), *Designing and Conducting Mixed Method Research*, 2nd ed., Sage, Thousand Oaks, CA.
- Delic, M., Eyers, D.R. and Mikulic, J. (2019), "Additive manufacturing: empirical evidence for SCI and performance from the automotive industry", *Supply Chain Management: An International Journal*, Vol. 24 No. 5, pp. 604-621, doi: [10.1108/scm-12-2017-0406](https://doi.org/10.1108/scm-12-2017-0406).
- Despoudi, S., Papaioannou, G., Saridakis, G. and Dani, S. (2018), "Does collaboration pay in agricultural supply chain? An empirical approach", *International Journal of Production Research*, Vol. 56 No. 13, pp. 4396-4417, doi: [10.1080/00207543.2018.1440654](https://doi.org/10.1080/00207543.2018.1440654).
- Ding, M.J., Kam, B.H. and Lalwani, C.S. (2012), "Operational routines and supply chain competencies of Chinese logistics service providers", *International Journal of Logistics Management*, Vol. 23 No. 3, pp. 383-407, doi: [10.1108/09574091211289237](https://doi.org/10.1108/09574091211289237).
- Economic Policy Research Centre (2018), *Fostering a Sustainable Agro-Industrialisation Agenda in Uganda*, Kampala.
- Farida, N., Joseph, N., Sheila, N.L., Levi, K. and Moses, M. (2024), "Asset specificity, relational governance, firm adaptability and supply chain integration", *Modern Supply Chain Research and Applications*, Vol. 6 No. 1, pp. 2-30, doi: [10.1108/MS CRA-09-2022-0021](https://doi.org/10.1108/MS CRA-09-2022-0021).
- Fowler, M. and Rauschendorfer, J. (2019), "Agro-industrialisation in Uganda. Current status, future prospects and possible solutions to pressing challenges", *Working Paper*, F-IH-UGA-006-2.
- Ganbold, O., Matsui, Y. and Rotaru, K. (2020), "Effect of information technology-enabled SCI on firm's operational performance", *Journal of Enterprise Information Management*, doi: [10.1108/JEIM-10-2019-0332](https://doi.org/10.1108/JEIM-10-2019-0332).
- Garces Rivera, M. and Pfeiffer, A. (2018), *The Health of the Ugandan Coffee Business Ecosystem*, Karlstad University.
- Garrido-Vega, P., Sacristán-Díaz, M., Moyano-Fuentes, J. and Alfalla-Luque, R. (2021), "The role of competitive environment and strategy in the supply chain's agility, adaptability and alignment capabilities", *European Journal of Management and Business Economics*, Vol. 32 No. 2, pp. 133-148, doi: [10.1108/EJMBE-01-2021-0018](https://doi.org/10.1108/EJMBE-01-2021-0018).
- Gawankar, S.A., Gunasekaran, A. and Kamble, S. (2019), "A study on investments in the big data-driven supply chain, performance measures and organisational performance in Indian retail 4.0

- context”, *International Journal of Production Research*, Vol. 58 No. 5, pp. 1574-1593, doi: [10.1080/00207543.2019.1668070](https://doi.org/10.1080/00207543.2019.1668070).
- Goldstein, J., Hazy, J.K. and Lichtenstein, B.B. (2010), “Complexity and the nexus of leadership: leveraging nonlinear science to create ecologies of innovation”.
- Goodhue, D.L., Lewis, W. and Thompson, R. (2012), “Does PLS have advantages for small sample size or non-normal data?”, *MIS Quarterly*, Vol. 36 No. 3, pp. 981-1001, doi: [10.2307/41703490](https://doi.org/10.2307/41703490).
- Gu, M., Yang, L. and Huo, B. (2020), “The impact of information technology usage on supply chain resilience and performance: an ambidexterous view”, *International Journal of Production Economics*, Vol. 232, 107956, doi: [10.1016/j.ijpe.2020.107956](https://doi.org/10.1016/j.ijpe.2020.107956).
- Guo, Y., Wang, L. and Chen, Y. (2020), “Green entrepreneurial orientation and green innovation: the mediating effect of supply chain learning”, *Sage Open*, Vol. 10 No. 1, doi: [10.1177/2158244019898798](https://doi.org/10.1177/2158244019898798).
- Hair, J.F. Jr, Anderson, R.E., Tatham, R.L. and Black, W.C. (1995), *Multivariate Data Analysis with Readings*, 4th ed., Prentice Hall, NJ.
- Hair, J., Hollingsworth, C.L., Randolph, A.B. and Chong, A.Y.L. (2017), “An updated and expanded assessment of PLS-SEM in information systems research”, *Industrial Management and Data Systems*, Vol. 117 No. 3, pp. 442-458, doi: [10.1108/imsd-04-2016-0130](https://doi.org/10.1108/imsd-04-2016-0130).
- Helfat, C.E. and Raubitschek, R.S. (2018), “Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems”, *Research Policy*, Vol. 47 No. 8, pp. 1391-1399, doi: [10.1016/j.respol.2018.01.019](https://doi.org/10.1016/j.respol.2018.01.019).
- Hernández-Espallardo, M., Rodríguez-Orejuela, A. and Sánchez-Pérez, M. (2010), “Inter-organizational governance, learning and performance in supply chains”, *Supply Chain Management: An International Journal*, Vol. 15 No. 2, pp. 101-114, doi: [10.1108/13598541011028714](https://doi.org/10.1108/13598541011028714).
- Huang, M.-C. and Huang, H.-H. (2018), “How transaction-specific investments influence firm performance in buyer- supplier relationships: the mediating role of SCI”, *Asia Pacific Management Review*, Vol. 24 No. 2, pp. 167-175, doi: [10.1016/j.apmr.2018.03.001](https://doi.org/10.1016/j.apmr.2018.03.001).
- Huo, B., Zhao, X. and Zhou, H. (2014), “The effects of competitive environment on supply chain information sharing and performance: an empirical study in China”, *Production and Operations Management*, Vol. 23 No. 4, pp. 552-569, doi: [10.1111/poms.12044](https://doi.org/10.1111/poms.12044).
- Ivanov, D. (2021), “Supply Chain Viability and the COVID-19 pandemic: a conceptual and formal generalization of four major adaptation strategies”, *International Journal of Production Research*, Vol. 59 No. 12, pp. 3535-3552, doi: [10.1080/00207543.2021.1890852](https://doi.org/10.1080/00207543.2021.1890852).
- Jacobides, M.G., Cennamo, C. and Gawer, A. (2018), “Towards a theory of ecosystems”, *Strategic Management Journal*, Vol. 39 No. 8, pp. 2255-2276, doi: [10.1002/smj.2904](https://doi.org/10.1002/smj.2904).
- Jambulingam, T. and Kathuria, R. (2020), “Antecedents to buyer-supplier coordination in the pharmaceutical supply chain”, *International Journal of Pharmaceutical and Healthcare Marketing*, Vol. 14 No. 2, pp. 289-303, doi: [10.1108/ijphm-08-2019-0058](https://doi.org/10.1108/ijphm-08-2019-0058).
- Jean, R.B., Kim, D., Shin, G. and Hult, T. (2021), “Enhancing performance in emerging-market-supplier/MNEbuyer relationships: an examination of the interplay between virtual and relational governance”, *Industrial Marketing Management*, Vol. 93, pp. 101-114, doi: [10.1016/j.indmarman.2020.12.007](https://doi.org/10.1016/j.indmarman.2020.12.007).
- Jose, A. and Shanmugam, P.V. (2019), “Supply chain issues in SME food sector: a systematic review”, *Journal of Advances in Management Research*, Vol. 17 No. 1, pp. 19-65, doi: [10.1108/jamr-02-2019-0010](https://doi.org/10.1108/jamr-02-2019-0010).
- Joughin, J. (2019), “The political economy of the rice industry in Uganda”.
- Kalubanga, M. and Namagembe, S. (2021), “Trust, commitment, logistics outsourcing relationship quality, relationship satisfaction, strategy alignment and logistics performance – a case of selected manufacturing firms in Uganda”, *International Journal of Logistics Management*, Vol. 33 No. 1, pp. 102-140, doi: [10.1108/IJLM-05-2020-0215](https://doi.org/10.1108/IJLM-05-2020-0215).

- Kanyoma, K.E., Agbola, F.W. and Oloruntoba, R. (2018), "An evaluation of SCI across multi-tier supply chains of manufacturing-based SMEs in Malawi", *International Journal of Logistics Management*, Vol. 29 No. 3, pp. 1001-1024, doi: [10.1108/IJLM-10-2017-0277](https://doi.org/10.1108/IJLM-10-2017-0277).
- Kanyoma, K.E., Agbola, F.W. and Oloruntoba, R. (2020), "Inhibitors and enablers of SCI across multiple supply chain tiers: evidence from Malawi", *International Journal of Logistics Management*, Vol. 32 No. 2, pp. 618-649, doi: [10.1108/IJLM-06-2019-0161](https://doi.org/10.1108/IJLM-06-2019-0161).
- Kataike, J. (2019), "Impact of chain governance structures and chain performance: the case of dairy sector in Uganda", Doctoral thesis, Ghent University.
- Kembro, J. and Selviaridis, K. (2015), "Exploring information sharing in the extended supply chain: an interdependence perspective", *Supply Chain Management: An International Journal*, Vol. 20 No. 4, pp. 455-470, doi: [10.1108/scm-07-2014-0252](https://doi.org/10.1108/scm-07-2014-0252).
- Ketokivi, M. and Mahoney, J.T. (2020), "Transaction cost economics as a theory of supply chain efficiency", *Production and Operations Management*, Vol. 29 No. 4, pp. 1011-1031, doi: [10.1111/poms.13148](https://doi.org/10.1111/poms.13148).
- Khanuja, A. and Jain, R.K. (2020), "Supply chain integration: a review of enablers, dimensions and performance", *Benchmarking: An International Journal*, Vol. 27 No. 1, pp. 264-301, doi: [10.1108/bij-07-2018-0217](https://doi.org/10.1108/bij-07-2018-0217).
- Krejcie, R.V. and Morgan, D.W. (1970), "Determining sample size for research activities", *Educational and Psychological Measurement*, Vol. 30 No. 3, pp. 607-610, doi: [10.1177/001316447003000308](https://doi.org/10.1177/001316447003000308).
- Kumar, V., Jabarzadeh, Y., Jeihouni, P. and Garza-Reyes, J.A. (2020), "Learning orientation and innovation performance: the mediating role of operations strategy and supply chain integration", *Supply Chain Management: An International Journal*, Vol. 25 No. 4, pp. 457-474, doi: [10.1108/scm-05-2019-0209](https://doi.org/10.1108/scm-05-2019-0209).
- Lakuma, P.C., Sunday, N., Sserunjogi, B., Kahunde, R. and Munyambonera, E.F. (2020), "How has the COVID-19 pandemic impacted Ugandan businesses? Results from a business climate survey", EPRC BCI Special report No. 1.
- Lakuma, C.P., Sunday, N., Sserunjogi, B., Kahunde, R. and Ogwang, A. (2021), "The effect of COVID-19 on the operations of agro-processing MSMEs in Uganda", *Policy Note*, Vol. 5 No. 3, pp. 1-5.
- Lee, H.L. (2004), "The triple-a supply chain", *Harvard Business Review*, Vol. 82 No. 10, pp. 102-112.
- Lee, J.Y., Yoo, S., Lee, Y., Park, S. and Yoon, S.W. (2019), "Individual and organisational factors affecting knowledge workers' perceptions of the effectiveness of informal learning: a multilevel analysis", *Vocations and Learning*, Vol. 12 No. 1, pp. 155-177, doi: [10.1007/s12186-019-09218-z](https://doi.org/10.1007/s12186-019-09218-z).
- Letaifa, S.B. (2014), "The uneasy transition from supply chains to ecosystems", *Management Decision*, Vol. 52 No. 2, pp. 278-295, doi: [10.1108/md-06-2013-0329](https://doi.org/10.1108/md-06-2013-0329).
- Li, H., Yang, Y., Singh, P., Sun, H. and Tian, Y. (2023), "Servitization and performance: the moderating effect of supply chain integration", *Production Planning and Control*, Vol. 34 No. 3, pp. 242-259, doi: [10.1080/09537287.2021.1905900](https://doi.org/10.1080/09537287.2021.1905900).
- Lisi, W., Zhu, R. and Yuan, C. (2019), "Embracing green innovation via green supply chain learning: the moderating role of green technology turbulence", *Sustainable Development*, Vol. 28, pp. 1-14, doi: [10.1002/sd.1979](https://doi.org/10.1002/sd.1979).
- Liu (2017), "Creating competitive advantage: linking perspectives of organization learning, innovation behavior and intellectual capital", *International Journal of Hospitality Management*, Vol. 66, pp. 13-23, doi: [10.1016/j.ijhm.2017.06.013](https://doi.org/10.1016/j.ijhm.2017.06.013).
- Liu, G., Aroean, L. and Ko, W.W. (2019), "A business ecosystem perspective of supply chain justice practices: a study of a marina resort supply chain ecosystem in Indonesia", *International Journal of Operations and Production Management*, Vol. 39 Nos 9/10, pp. 1122-1143, doi: [10.1108/ijopm-09-2018-0578](https://doi.org/10.1108/ijopm-09-2018-0578).
- Magassouba, S.M., Tambi, A.M.B.A., Alkhlaifat, B.I. and Abdullah, A.A.B. (2019), "Influence of stakeholders involvement on development project performance in Guinea", *International*

- Journal of Academic Research in Business and Social Sciences*, Vol. 9 No. 1, pp. 1111-1120, doi: [10.6007/ijarbss/v9-i1/5513](https://doi.org/10.6007/ijarbss/v9-i1/5513).
- Mahapatra, S., William, W.S. and Padhy, R. (2019), "Alignment in the base of the pyramid producer supply chains: the case of the handloom sector in Odisha, India", *Journal of Business Logistics*, Vol. 40 No. 2, pp. 126-144, doi: [10.1111/jbl.12211](https://doi.org/10.1111/jbl.12211).
- Makoni, N., Redda, T., van der Lee, J., Mwai, R. and van der Zijpp, A. (2014), *White Gold: Opportunities for Dairy Sector Development Collaboration in East Africa*, Centre for Development Innovation Wageningen UR.
- Mandal, S., Bhattacharya, S., Korasiga, V.R. and Sarathy, R. (2017), "The dominant influence of logistics capabilities on integration: empirical evidence from supply chain resilience", *International Journal of Disaster Resilience in the Built Environment*, Vol. 8 No. 4, pp. 357-374, doi: [10.1108/IJDRBE-05-2016-0019](https://doi.org/10.1108/IJDRBE-05-2016-0019).
- McMillan, E. (2008), "Complexity, management and the dynamics of change: challenges for practice".
- Mikhailov, A., Oliveira, C., Padula, A.D. and Reichert, F.M. (2021), "Californian innovation ecosystem: emergence of agtechs and the new wave of agriculture", *Innovation and Management Review*, Vol. 18 No. 3, pp. 292-307, doi: [10.1108/INMR-12-2018-0098](https://doi.org/10.1108/INMR-12-2018-0098).
- Munu, M. (2019), "Financing Uganda's integration in the global value chains; the case of cotton and textile industry", in *Agricultural Finance Year Book 2019*, Economic Policy Research Centre (EPRC), Kampala.
- Murfield, M., Boone, C.A., Rutner, P. and Thomas, R. (2017), "Investigating logistics service quality in omni-channel retailing", *International Journal of Physical Distribution and Logistics Management*, Vol. 47 No. 4, pp. 263-296, doi: [10.1108/ijpdlm-06-2016-0161](https://doi.org/10.1108/ijpdlm-06-2016-0161).
- Mutebi, H., Ntayi, J.M., Muhwezi, M. and Munene, J.C.K. (2020), "Self-organisation, adaptability, organisational networks and inter-organisational coordination: empirical evidence from humanitarian organisations in Uganda", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 10 No. 4, pp. 447-483, doi: [10.1108/JHLSCM-10-2019-0074](https://doi.org/10.1108/JHLSCM-10-2019-0074).
- Namagembe, S. (2020), "Enhancing service delivery in humanitarian relief chains: the role of relational capital", *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 10 No. 2, pp. 169-203, doi: [10.1108/jhlscm-06-2019-0038](https://doi.org/10.1108/jhlscm-06-2019-0038).
- Nguyen, M.A.T., Lei, H., Vu, K.D. and Le, P.B. (2019), "The role of cognitive proximity on supply chain collaboration for radical and incremental innovation: a study of a transition economy", *Journal of Business and Industrial Marketing*, Vol. 34 No. 3, pp. 591-604, doi: [10.1108/JBIM-07-2017-0163](https://doi.org/10.1108/JBIM-07-2017-0163).
- Obwona, M., Shinyekwa, I., Kiiza, J. and Hisali, E. (2014), "*The evolution of industry in Uganda*. The World institute for development economics research", Working Paper (2014/021), pp. 1-57.
- OECD (2020), "Going digital integrated policy framework: *Digital economy papers February*", p. 292.
- Onward Resources International (2016), *High-level Presentation about the Current Status of Agriculture in Uganda*, PPT presentation, June, Kampala.
- Oubrahim, I., Sefiani, N. and Happonen, A. (2023), "The influence of digital transformation and supply chain integration on overall sustainable supply chain performance: an empirical analysis from manufacturing companies in Morocco", *Energies*, Vol. 16 No. 2, p. 1004.
- Ouma, E., Ochieng, J., Dione, M. and Pezo, D. (2016), "Governance structures and constraints along the Ugandan smallholder pig value chains", *International Conference of the African Association of Agricultural Economists*, Addis Ababa, September 23-26.
- Palacios, L.L., Juste, V.B., Redondo, Y.P. and Grünhage, M. (2014), "Technological opportunism effects on IT adoption, intra-firm diffusion and performance: evidence from the U.S. and Spain", *Journal of Business Research*, Vol. 67 No. 6, pp. 1178-1188, doi: [10.1016/j.jbusres.2013.05.004](https://doi.org/10.1016/j.jbusres.2013.05.004).
- Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N. and Hoagwood, K. (2015), "Purposeful sampling for qualitative data collection and analysis in mixed method implementation research", *Administration and Policy in Mental Health and Mental Health Services Research*, Vol. 42 No. 5, pp. 533-544, doi: [10.1007/s10488-013-0528-y](https://doi.org/10.1007/s10488-013-0528-y).

- Prieto-Pastor, I., Martín-Pérez, V. and Martín-Cruz, N. (2018), "Social capital, knowledge integration and learning in project-based organizations: a CEO-based study", *Journal of Knowledge Management*, Vol. 22 No. 8, pp. 803-1825, doi: [10.1108/jkm-05-2017-0210](https://doi.org/10.1108/jkm-05-2017-0210).
- Rajaguru, R. and Matanda, M.J. (2019), "Role of compatibility and supply chain process integration in facilitating supply chain capabilities and organizational performance", *Supply Chain Management: An International Journal*, Vol. 24 No. 2, pp. 301-316, doi: [10.1108/SCM-05-2017-0187](https://doi.org/10.1108/SCM-05-2017-0187).
- Ramanathan, U. and Gunasekaran, A. (2014), "Supply chain collaboration: impact of success in long-term partnerships", *International Journal of Production Economics*, Vol. 147 No. 1, pp. 252-259, doi: [10.1016/j.ijpe.2012.06.002](https://doi.org/10.1016/j.ijpe.2012.06.002).
- Ramirez-Portilla, A., Cagno, E. and Brown, T.E. (2017), "Open innovation in specialized SMEs: the case of supercars", *Business Process Management Journal*, Vol. 23 No. 6, pp. 1167-1195, doi: [10.1108/BPMJ-10-2016-0211](https://doi.org/10.1108/BPMJ-10-2016-0211).
- Rong, K., Shi, Y. and Yu, J. (2012), "Nurturing business ecosystems to deal with industry uncertainties", *Industrial Management and Data Systems*, Vol. 113 No. 3, pp. 385-402, doi: [10.1108/02635571311312677](https://doi.org/10.1108/02635571311312677).
- Scholten, K., Sharkey-Scott, P. and Fynes, B. (2019), "Mitigation processes - antecedents for building supply chain resilience", *Supply Chain Management: An International Journal*, Vol. 19 No. 2, pp. 211-228, doi: [10.1108/scm-06-2013-0191](https://doi.org/10.1108/scm-06-2013-0191).
- Selviaridis, K. and Spring, M. (2018), "Supply chain alignment as process: contracting, learning and pay-for-performance", *International Journal of Operations and Production Management*, Vol. 38 No. 3, pp. 732-755, doi: [10.1108/IJOPM-01-2017-0059](https://doi.org/10.1108/IJOPM-01-2017-0059).
- Shahzad, F., Xiu, G.Y. and Shahbaz, M. (2017), "Organizational culture and innovation performance in Pakistan's software industry", *Technology in Society*, Vol. 51, pp. 66-73, doi: [10.1016/j.techsoc.2017.08.002](https://doi.org/10.1016/j.techsoc.2017.08.002).
- Shan, H., Bai, D., Li, Y., Shi, J. and Yang, S. (2023), "Supply chain partnership and innovation performance of manufacturing firms: mediating effect of knowledge sharing and moderating effect of knowledge distance", *Journal of Innovation and Knowledge*, Vol. 8 No. 4, 100431, doi: [10.1016/j.jik.2023.100431](https://doi.org/10.1016/j.jik.2023.100431).
- Sheel, A. and Nath, V. (2019), "Effect of blockchain technology adoption on supply chain adaptability, agility, alignment and performance", *Management Research Review*, Vol. 42 No. 12, pp. 1353-1374, doi: [10.1108/mrr-12-2018-0490](https://doi.org/10.1108/mrr-12-2018-0490).
- Sheriff, M. and Muffatto, M. (2015), "The present state of entrepreneurship ecosystems in selected countries in Africa", *African Journal of Economic and Management Studies*, Vol. 6 No. 1, pp. 17-54, doi: [10.1108/ajems-10-2012-0064](https://doi.org/10.1108/ajems-10-2012-0064).
- Shukor, A.A.A., Newaz, M.S., Rahman, M.K. and Taha, A.Z. (2021), "Supply chain integration and its impact on supply chain agility and organizational flexibility in manufacturing firms", *International Journal of Emerging Markets*, Vol. 16 No. 8, pp. 1721-1744, doi: [10.1108/IJOEM-04-2020-0418](https://doi.org/10.1108/IJOEM-04-2020-0418).
- Siagian, H., Tarigan, Z.J.H. and Jie, F. (2021), "Supply chain integration enables resilience, flexibility, and innovation to improve business performance in COVID-19 Era", *Sustainability*, Vol. 13 No. 9, p. 4669, doi: [10.3390/su13094669](https://doi.org/10.3390/su13094669).
- Silvestre, B.S., Silva, M.E., Cormack, A. and Thome, A.M.T. (2020), "Supply chain sustainability trajectories: learning through sustainability initiatives", *International Journal of Operations and Production Management*, Vol. 40 No. 9, pp. 1301-1337, doi: [10.1108/IJOPM-01-2020-0043](https://doi.org/10.1108/IJOPM-01-2020-0043).
- Singh, B. and Rao, M.K. (2016), "Effect of intellectual capital on dynamic capabilities", *Journal of Organizational Change Management*, Vol. 29 No. 2, pp. 129-149, doi: [10.1108/JOCM-12-2014-0225](https://doi.org/10.1108/JOCM-12-2014-0225).
- Song, G. and Song, S. (2021), "Fostering SCI in omni-channel retailing through human resource factors: empirical study in China's market", *International Journal of Logistics Research and Applications*, Vol. 24 No. 1, pp. 1-22, doi: [10.1080/13675567.2020.1713305](https://doi.org/10.1080/13675567.2020.1713305).

- Statsenko, L., Gorod, A. and Ireland, V. (2018), "A complex adaptive systems governance framework for regional supply networks", *Supply Chain Management*, Vol. 23 No. 4, pp. 293-312, doi: [10.1108/scm-08-2017-0279](https://doi.org/10.1108/scm-08-2017-0279).
- Tiwari, S. (2021), "Supply chain integration and Industry 4.0: a systematic literature review", *Benchmarking: An International Journal*, Vol. 28 No. 3, pp. 990-1030, doi: [10.1108/BIJ-08-2020-0428](https://doi.org/10.1108/BIJ-08-2020-0428).
- Toye, O. (2012), "Dairy industry in Uganda: value chain analysis: TechnoServe".
- Tseng, F.M., Weng, J.Y. and Wang, C.M. (2023), "How the supplier relationship, market position, and proximity impact supplier involvement and new product performance: co-developing new products with close suppliers who are market leaders results in better NPD performance", *Research-Technology Management*, Vol. 66 No. 1, pp. 53-65, doi: [10.1080/08956308.2022.2141560](https://doi.org/10.1080/08956308.2022.2141560).
- Tukamuhabwa, B., Mutebi, H. and Isabirye, D. (2021), "Supplier performance in the public healthcare: internal social capital, logistics capabilities and supply chain risk management capabilities as antecedents in a developing economy", *Journal of Business and Socio-economic Development*, Vol. 3 No. 1, pp. 50-68, doi: [10.1108/jbsed-04-2021-0046](https://doi.org/10.1108/jbsed-04-2021-0046).
- Tumushabe, A. (2020), "Dairy farmers struggle to find market for their milk", *Daily Monitor*.
- Turkulainen, V., Roh, J., Whipple, J.M. and Swink, M. (2017), "Managing internal SCI: integration mechanisms and requirements", *Journal of Business Logistics*, pp. 1-20, doi: [10.1111/jbl.12165](https://doi.org/10.1111/jbl.12165).
- Uganda Bureau of Statistics (2011/2012), "Census of business establishments, 2010/11 report", available at: <http://www.ubos.org/onlinefiles/uploads/ubos/pdf%20documents/2010%20COBE%20Report.pdf>
- United Nations (2017), "Sustainable development goals: goal 17: revitalize the global partnership for sustainable development" available at: www.un.org/sustainabledevelopment/globalpartnerships
- Urry, J. (2005), "The complexity turn", *Theory, Culture and Society*, Vol. 22 No. 5, pp. 1-14, doi: [10.1177/0263276405057188](https://doi.org/10.1177/0263276405057188).
- van Dijk, M.P., Limpens, G., Kariuki, J.G. and de Boer, D. (2021), "Telephone farmers and an emerging ecosystem are unlocking the hidden middle of agricultural value chains in Kenya through innovation", *Journal of Agribusiness in Developing and Emerging Economies*, Vol. 13 No. 3, pp. 452-467, doi: [10.1108/JADEE-03-2021-0059](https://doi.org/10.1108/JADEE-03-2021-0059).
- Waiswa, D., Günlü, A. and Mat, B. (2021), "Development opportunities for livestock and dairy cattle production in Uganda: a Review", *Research Journal of Agriculture and Forestry Sciences*, Vol. 9 No. 1, pp. 18-24.
- Wang, E.T.G. and Wei, H. (2007), "Inter-organizational governance value creation: coordinating for information visibility and flexibility in supply chains", *Decision Sciences*, Vol. 38 No. 4, pp. 647-674, doi: [10.1111/j.1540-5915.2007.00173.x](https://doi.org/10.1111/j.1540-5915.2007.00173.x).
- Wang, L., Jiang, F., Li, J., Motohashi, K. and Zheng, X. (2019), "The contingent effects of asset specificity, contract specificity, and trust on offshore relationship performance", *Journal of Business Research*, Vol. 99, pp. 338-349, doi: [10.1016/j.jbusres.2019.02.055](https://doi.org/10.1016/j.jbusres.2019.02.055).
- Williamson, O.E. (1971), "The vertical integration of production: market failure considerations", *The American Economic Review*, Vol. 61 No. 2, pp. 112-123.
- Williamson, O.E. (1975), *Markets and Hierarchies, Analysis and Antitrust Implications*, Press, New York.
- Williamson, O.E. (1985), *The Economic Institutions of Capitalism*, Free Press, New York.
- Williamson, O.E. (2010), "Transaction cost economics: the natural progression", *The American Economic Review*, Vol. 100 No. 3, pp. 673-690, doi: [10.1257/aer.100.3.673](https://doi.org/10.1257/aer.100.3.673).
- Wong, C.Y., Boon-itt, S. and Wong, C.W.Y. (2011), "The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance", *Journal of Operation Management*, Vol. 29 No. 6, pp. 604-615, doi: [10.1016/j.jom.2011.01.003](https://doi.org/10.1016/j.jom.2011.01.003).
- World Bank (2018), "Developing the agri-food system for inclusive economic growth", in *Uganda Economic Update*, 12th ed.

- Xiao, C., Petkova, B., Molleman, E. and van der Vaart, T. (2019), "Technology uncertainty in supply chains and supplier involvement: the role of resource dependence", *Supply Chain Management: An International Journal*, Vol. 24 No. 6, pp. 697-709, doi: [10.1108/scm-10-2017-0334](https://doi.org/10.1108/scm-10-2017-0334).
- Yigitbasiglu, O.M. (2010), "Information sharing with key suppliers: a transaction cost theory perspective", *International Journal of Physical Distribution and Logistics Management*, Vol. 40 No. 7, pp. 550-578, doi: [10.1108/09600031011072000](https://doi.org/10.1108/09600031011072000).
- Yu, Y., Huo, B. and Zhang, Z. (2020), "Impact of information technology on supply chain integration and company performance: evidence from cross-border e-commerce companies in China", *Journal of Enterprise Information Management*, Vol. 34 No. 1, pp. 1741-0398, doi: [10.1108/JEIM-03-2020-0101](https://doi.org/10.1108/JEIM-03-2020-0101).
- Yunus, N.E. and Tadisina, K.S. (2016), "Drivers of SCI and the role of organizational culture", *Business Process Management Journal*, Vol. 22 No. 1, pp. 89-115, doi: [10.1108/bpmj-12-2014-0127](https://doi.org/10.1108/bpmj-12-2014-0127).
- Zhao, G., Chen, H., Liu, S., Dennehy, D., Jones, P. and Lopez, C. (2023), "Analysis of factors affecting cross-boundary knowledge mobilization in agri-food supply chains: an integrated approach", *Journal of Business Research*, Vol. 164, 114006, doi: [10.1016/j.jbusres.2023.114006](https://doi.org/10.1016/j.jbusres.2023.114006).

Further reading

- Argyres, N.S. and Zenger, T. (2012), "Capabilities, transaction costs, and firm boundaries", *Organization Science*, Vol. 23 No. 6, pp. 1643-1657, doi: [10.1287/orsc.1110.0736](https://doi.org/10.1287/orsc.1110.0736).
- Chenini, A., Iqbal, J., Qurrahtulain, K., Mahmood, M.A.H. and Aldehayyat, J.S. (2020), "Strategic procurement, supplier integration, and speed-to market: the mediating role of procurement lead-time performance and manufacturing performance", *Journal of Public Affairs*, Vol. 21 No. 3, e2248, doi: [10.1002/pa.2248](https://doi.org/10.1002/pa.2248).
- Dyer, J.H. and Singh, H. (1998), "The relational view: cooperative strategy and sources of Inter organizational competitive advantage", *Academy of Management Review*, Vol. 23 No. 4, pp. 660-679, doi: [10.5465/amr.1998.1255632](https://doi.org/10.5465/amr.1998.1255632).
- Marshall, A., Lipp, A., Ikeda, K. and Singh, R.R. (2020), "Ecosystems boost revenues from innovation initiatives: strategy and leadership", *Strategy and Leadership*, Vol. 48 No. 4, pp. 17-27.
- Odongo, W., Kumar, D.M., Molnar, A., Ongeng, D. and Gellynck, X. (2017), "Role of power in supply chain performance: evidence from agribusiness SMEs in Uganda", *Journal of Agribusiness in Developing and Emerging Economies*, Vol. 7 No. 3, pp. 339-354, doi: [10.1108/jadee-09-2016-0066](https://doi.org/10.1108/jadee-09-2016-0066).

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