International Journal of Financial and Investment Studies (IJFIS)
Vol. 5 No. 1, October 2024: 25-42
e-ISSN 2745-3952
DOI: https://doi.org/10.9744/ijfis.5.1.25-42

THE EFFECT OF SUPPLY CHAIN COLLABORATION ON SUPPLY CHAIN PERFORMANCE THROUGH PRODUCTION TECHNOLOGY, NEW PRODUCT DEVELOPMENT, AND PRODUCT KNOWLEDGE

Enny Novijanti[1], Hotlan Siagian[2]
[1,2] School of Business and Management, Petra Christian University
Jl. Siwalankerto 121-131, Surabaya, Indonesia
Corresponding author: [2]hotlan.siagian@petra.ac.id

ABSTRACT

Manufacturing companies are making a quick effort in anticipation of erratic business changes. Internal changes were made to adapt to the company's external conditions. Partnerships are needed to connect internal and external parties through supply chain collaboration, thereby improving supply chain performance and increasing competitiveness. Data collection from 99 manufacturing companies. The hypothesis was tested using partial least squares software. The data processing results indicate that supply chain collaboration positively influences product technology, product knowledge, new product development, and supply chain performance. The company's product technology has a positive impact on improving product knowledge, new product development and supply chain performance. The results of the hypothesis test also show that supply chain performance is influenced by product knowledge and new product development. The contribution of the theory of research results to enrich supply chain theory in producing product technology, product knowledge, and company competitiveness. A practical contribution is to provide guidance for company managers to carry out supply chain collaboration to improve performance and competitiveness.

Keywords: new product development, product knowledge, product technology, supply chain collaboration, supply chain performance.

INTRODUCTION

The pace of the world economy, especially at the end of the first quarter of 2020, is a very detrimental phenomenon for all mankind in various countries and the deterioration of Indonesia's economic conditions (Iskandar et al., 2020). The rapid changes in the business world as a result of the pandemic require companies to be able to adapt to technological developments and improve internal and external performance in order to compete in the market (R. and D. Suharto, 2013). Competition is the core of a company's success or failure, so strategic thinking is needed for every business actor to be able to maintain his business and be able to compete in the business world and be able to maintain his competitive position against competitors (Suharto, 2018).

The competition of each company must be able to win the competition by displaying the best products and being able to meet the ever-evolving and changing tastes of consumers (Andini, 2017). The company always strives to be able to understand the needs of the market, strong competition in the global era in order to be able to communicate quickly to suppliers. To achieve competitive advantage, companies not only rely on the resources they have but also innovate efforts in creating a sustainable competitive advantage that requires supply chain collaboration efforts (Baah et al., 2022a) and focusing on improving financial performance (Salam, 2017). A company's ability to build collaboration and maintain collaborative relationships is critical to increasing competitiveness and long-term success. (Baah et al., 2022b)

Companies must carry out business collaborations with various parties, both with suppliers, distributors and even with their consumers. This condition is mainly faced by companies that want to expand their activities to international or global markets. The company's ability to manage competition and collaborate with suppliers to understand customer needs requires technology. The implementation of technology makes for short, timely product cycles and continuous interaction with suppliers and customers (Salehi et al., 2021). Information and communication technology used in the industry is able to increase integration between companies as a form of collaboration with suppliers (Salehi et al., 2021).

Collaborations carried out by companies can provide benefits in the form of access to the market, technology, innovation opportunities, knowledge creation and improving human and organizational capabilities. Collaboration

between companies and their partners or supply chain collabarotion will have a positive effect, namely the use of technology and knowledge, opportunities to innovate, and can improve the capabilities of organizations or companies and can expand the marketing of products or services (Jane, 2011). The use of technology in a company's production can be applied in the form of information technology that aims to reduce costs and increase the company's production efficiency (Salehi et al., 2021). Faced with evolving technologies, various service options across many industries have expanded, thereby broadening the range of service innovations for certain companies; hence, information technology provides a significant opportunity to digitize significant technology-based service innovations into their service product innovations (Tsou, 2012). Manufacturing companies must rethink their strategies to adopt more innovative practices to create greater value and ultimately improve their competitive position (Ferreira et al., 2020). The implications of innovation need to be supported by knowledge of the product, including the overall, accurate information that consumers obtain as their perception of the product, as today's customers need more variety of products and services, shorter lead times, and lower prices, in addition to high quality and more customization.

New knowledge to create new products or change products, processes, and services to deliver new value for customers through innovation will increase financial efficiency (Tsou, 2012). The implications of innovating need to be supported by knowledge of the product that includes the overall accurate information that consumers obtain as their perception of the product, because today's customers need more variety of products and services, shorter waiting times, and lower prices in addition to high quality and more customization (Sangtani & Murshed, 2017). The implementation of SCM and the selection of the right suppliers make the company superior to other companies (Gallear et al., 2012), although, in reality, not a few supply chain collaboration strategies are carried out successfully. This is due to a lack of insight into the factors that affect the success of collaboration. Based on previous research, there has been no discussion of how production technology capabilities, new product development, and product knowledge achieved through supply chain collaboration can improve supply chain performance. This article is written with several sections, namely the second section literature review and the relationship between concepts, the third section research methods, the fourth section analysis and discussion, and finally the fifth is the conclusion and implications of the research.

Supply Chain Management

The supply chain is a network that connects companies with their suppliers to produce goods that are then sent to customers (Kotzab et al., 2015). Supply chain management is the management of the supply chain from upstream to downstream, with products processed and distributed to consumers at a lower cost (Christopher, 2021). The coordination of all supply chain management activities is designed to be most effective and efficient, from planning, regulating, and scheduling the flow of raw materials to their distribution to consumers (Andini, 2017).

Supply chain integration is a set of activities that coordinate product flows among supply chain partners, including transactions, material movements, procedures, customer service, and optimization processes. The series of product processes aims to minimize costs and achieve the desired service level through an appropriate production process with respect to the accuracy of quantity, time, and place (Baah et al., 2022a). Supply chain management is the key to business processes, spanning from consumers to suppliers, who provide products, services, and information that add value to customers and other stakeholders by optimizing the flows of time, location, and material quantities (Birasnav & Bienstock, 2019).

The development of an integrated supply chain typically considers three perspectives: strategic, tactical, and operational. As an effective method for supply chain management, supply chain integration has become key to improving performance and creating value essential to the success of the company and the entire supply chain. (Fuadi, 2018). The selection of suitable suppliers in SCM implementation will affect the company's competitive advantage over other companies. Collaboration in supply chain management includes not only manufacturers and suppliers but also distributors, warehouses, and even consumers themselves. It is necessary to implement optimal supply chain performance (Chand et al., 2020).

Supply Chain Collaboration

Supply chain collaboration is a form of alliance or partnership among two or more parties within a company that establishes a cooperative bond based on agreement and mutual need to increase capacity and capability

and achieve better results that improve company performance. The results of Nagashima et al.'s (2015) research stated that cooperation with suppliers, consumers, and cross-functional teams within the company will improve the company's performance. Supply chain collaboration is designed to enhance the strategic and operational capabilities of each participating organization, helping them achieve significant sustainability benefits (Noke & Hughes, 2010). Collaboration emphasizes long-term, direct association and encourages joint planning and problem-solving efforts (Ferreira et al., 2020; Mishra et al., 2022), allowing organizations to work more effectively with several key suppliers who are willing to share responsibility for the success of product offerings and thereby improve the company's performance.

The strategic collaboration between the company and its partners serves as a bridge connecting various forms of exchange, including resources, expertise, and competencies among the companies. The company and its partners coordinate to achieve mutually agreed-upon goals. Strategic plans to anticipate threats from competing companies, namely the existence of superior products from new companies, the existence of substitute products with more selling value, supplier offers, customer offers that compete at competitive prices, and competition between companies in the same industry. For this reason, strategic thinking is needed when establishing collaborations with other companies, and effective cooperation is needed to achieve a stronger competitive position. Supply Chain Collaboration is measured by companies building strategic collaborations with external partners (SCC1), sharing product planning information with partners (SCC2), sharing benefits with partners (SCC3), and coordinating with partners to meet demand and create added value for consumers (SCC4).

Production Technology

A company or organization can create more value than competitors by providing products or services to consumers at lower cost, thereby achieving a competitive advantage. Selecting the product design desired by customers can encourage companies to innovate offerings based on competitive pressures to win certain market segments and maximize their competitive advantage.

If products have the right usability and aesthetic value, then consumers can carry out the purchase process. The more customers have a high acceptance of a product, the more it will benefit the company, and it can become a product with prominent advantages because customers are interested in it (Kotzab et al., 2015). Competitive advantage basically grows from the value or benefits that a company can create for its buyers that are more than the costs that the company has to spend to create it. Buyers will be willing to pay more if there is a product with high use value and equivalent benefits, or a product offering with unique benefits that exceed the price charged (Ghofar et al., 2020).

The use of technology in the company's production process can involve all components in carrying out company activities related to design, product customization, installation of technology equipment, and the continuous use of technology equipment as part of company activities (Karagouni, 2018). The use of technology can involve a variety of advanced machines connected to computerized systems (Laraswati, 2020). Production technology is the participation of all components in supply chain management. The role of suppliers will shift to providing quality goods that are converted into finished products according to customer demands. Production technology is a way of increasing production and productivity that can be widely applied in the manufacturing and service industries. Production technology can be described as the skill or excellence a company has in creating production tools to solve various problems in its production processes (Karagouni, 2018).

Production technology is a tool used to produce products by leveraging machine technology to increase efficiency, effectiveness, and productivity. The use of technology in company production can take the form of information technology, aimed at reducing costs and increasing the company's production efficiency (Salehi et al., 2021). Information technology provides significant opportunities for the digitalization of service innovation and management. As more and more companies incorporate significant technology-based components into service product innovation (Tsou, 2012), there is growing interest in understanding how the current technological context in which a company's service product innovation is embedded affects its behavior and performance. Manufacturing companies must rethink their strategies towards more innovative practices to create higher value and ultimately improve their competitive position (Ferreira et al., 2020).

Production Technology is measured by the company's items using technology to produce products (PT1), relying on the internet network to carry out operations (PT2), having an integrated or connected information system facility between adequate internal functions (PT3), and providing information technology facilities in accordance with current needs (PT4).

New Product Development

Information technology is the basis of reference for various company activities related to the implications of innovation in product development, including the stages of the new product development process. According to Trott (2017), a company's strong competitiveness stems from the use of information technology (IT) devices across the NPD stages, including new product planning, product design, business analysis, and product development.

Innovation is already a fundamental thing to do in manufacturing companies, and it is no longer an option, so that inevitably, manufacturing companies must follow changes in innovating. Companies are also required to strive to create more value for consumers by introducing new products or by improving products at the production stage to be more competitive (Charisa, 2015). The creation of new products is the result of innovation. (Trott, 2017) said that the development of new products is, in principle, a process of changes made to existing products as well as a process of seeking innovation to add value to old goods by converting them into products and becoming more competitive business opportunities.

The use of the internet and IT tools (IT tool usage) is important for improving the quality and speed of testing, validation, and business analysis, and for evaluating the effectiveness and efficiency of new product development (Liao et al., 2010). New Product Development is measured by having a product uniqueness that is better than competitors and can meet consumer needs (NPD1), being able to develop new products according to consumer needs (NPD2), involving consumers through related departments in new product development (NPD3), being able to increase creativity in producing new products (NPD4) and being able to respond quickly to customer demands and develop new products (NPD5).

Product Knowledge

Product knowledge is a collection of various information about products, including product categories, brands, product terminology, product attributes or features, product prices, and beliefs about the product and its function as a consumer, which will determine whether the product purchased is appropriate or not, in accordance with or not with the needs and expectations of a consumer. According to Nitisusastro (2012), these include knowledge of product characteristics, knowledge of product benefits, knowledge of the risks of consuming products, and knowledge of product satisfaction with consumption. Product knowledge has a significant positive effect on media search, as its strong influence encourages consumers to learn and incorporate new information more easily. Product knowledge is consumer knowledge related to knowledge about the characteristics or character of the product, the consequences of using the product, and the value (level) of satisfaction that will be achieved by the product (Hanzaee & Khosrozadeh, 2011).

Product knowledge is knowledge about a product's characteristics, benefits, risks, and satisfaction. The search for information about products is a stage consumers go through when determining which products are suitable for purchase, and previous studies have concluded that product knowledge significantly influences consumer purchase decisions. Product Knowledge is measured by providing technology according to the characteristics of the product produced (PK1), being able to respond quickly to consumers' understanding of the product needed (PK2), being able to describe the information and benefits of the product clearly (PK3), and conducting periodic and controlled product analysis and monitoring (PK4).

Supply Chain Performance

The performance of a company is the actual results or outputs produced, which are then measured and compared with expected results or outputs (Prayhoego & Devie, 2013). In general, researchers define the concept of corporate performance based on the idea that a company is a collection of productive assets that are deliberately formed, including human, physical, and capital resources, aimed at jointly achieving a goal.

Supply Chain Performance, or company performance, is something produced by a company within a certain period of time, or a period, by referring to a set standard that describes the empirical condition of a company and can be measured by its market orientation and financial goals (Chand et al., 2020).

Improved Supply Chain Performance contributes to competitive advantage by increasing customer satisfaction, increasing flexibility in meeting customer needs, controlling organizational costs, accelerating the launch of new products, thus gaining market share and driving greater business success (Chand et al., 2020).

The measurements of company performance often used in empirical research include financial, operational, and market-based performance (Stanton & Cook, 2019). In this study, we aim to highlight operational performance measurement, in which aspects can be measured when information related to opportunities already exists but has not yet been realized financially (Prayhoego & Devie, 2013). This operational performance can be measured by market share, new product launches, quality, marketing effectiveness, and customer satisfaction (Carton, 2004).

Company performance is the overall condition of the company over a certain period, related to the results or achievements of its operational activities in utilizing its resources. Performance is the set of an organization's actions or activities over a certain period, based on established standards and projected operational costs, with a focus on efficiency and management accountability (Darmasto et al., 2020). Company performance refers to how well a company is market-oriented and its financial goals (Ilmiyati & Munawaroh, 2016). Supply chain performance is measured by establishing regular planning (SCP1), having more effective and efficient product lead time (SCP2), producing quality products (SCP3), delivering products on time (SCP4), providing adequate services for customers (SCP5), and being able to reduce production costs and be more competitive (SCP6).

Relationship between Research Concepts

The Relationship between the Concept of Supply Chain Collaboration and Supply Chain Performance

Owners and managers of manufacturing companies, as respondents to 278 questionnaires with a response rate of 61%, confirmed that supply chain collaboration by creating a competitive strategy has a significant effect on company performance, and shows that restructuring of supply chain collaboration to advance environmental collaboration has a major impact on environmental and financial performance. Information sharing is key to improving competitive advantage and superior supply chain performance (Baah et al., 2022). A survey of 150 buyer-suppliers in South Korea with a SEM analysis model showed that development through contractual collaboration drives effectiveness, efficiency, and innovation, resulting in substantial benefits, as well as short cycle times, lower inventory, reduced costs, accurate delivery, and innovative results, allowing companies to enjoy a competitive advantage (Um&Oh, 2020).

A survey of supply chain managers at fast-moving consumer goods (FMCG) companies (Thailand Salam, 2017) found that trust in and capabilities of technology are significantly related to supply chain collaboration, operational performance, and competitiveness. Implementing cost efficiency and improving customer service will create a sustainable competitive advantage. Effective collaboration will result in superior performance and allow for faster new product development, improved quality, lower production costs, shorter cycle times, and better customer service. Successful collaborative work involves partnering to plan, coordinate activities, and resolve problems, as well as developing joint solutions, establishing joint planning, shared goals, and company performance metrics to align operations and improve relationships by building trust (Teng et al., 2022). Supply chain visibility significantly affects collaboration, agility, and performance, while supply chain collaboration and agility, in turn, significantly affect supply chain performance (Baah et al., 2022b). The hypothesis set based on the above explanation is
H_1: There is an influence of Supply Chain Collaboration on Supply Chain Performance.

The Relationship between the Concept of Supply Chain Collaboration and Production Technology

Supply chain management involves coordinating interconnected business networks that cover the products and services customers need, including transportation, raw material storage, and production phases.

Information and communication technology used by sugarcane industry companies in Khuzestan province, with 34 senior managers in large companies, helped eliminate obstacles to working with suppliers, enabling timely communication and adequate collaboration (Salehi et al., 2021). The use of technology in manufacturing companies in Thailand, totaling 181 companies in the form of FMCG (Fast Moving Consumer Goods), can increase supply chain collaboration significantly. The technology implemented by the company is able to eliminate obstacles between companies with suppliers and with their customers so that there is enthusiasm for strategic collaboration on all components of the supply chain (Salam, 2017).

The effective use and improvement of information technology and knowledge can overcome business challenges and strengthen strategic collaboration and relationship agreements (Wittmann et al., 2009). The management of relevant information flows in the supply chain can be improved through technological advancements, knowledge transfer, and information integration, which can serve as strategic competencies worth developing (Nagashima et al., 2015).

Collaboration in supply chain management is built on trust and commitment. In this case, information technology has enabled these collaborative practices, and there is a clear development path in the capabilities and sophistication of the underlying technology infrastructure that supports collaboration. Salehi et al. (2021) argue that collaboration can be achieved through both trust and electronically mediated exchanges, ultimately improving the operational performance of buyer-suppliers by increasing efficiency. Manufacturing companies demonstrate that supply chain collaboration positively affects technological innovation and that collaboration with external agents encourages both incremental and radical innovation. Information technology directly enhances both types of product innovation and indirectly enhances them through supply chain collaboration (Jimenez-Jimenez et al., 2019). The hypothesis is determined based on the explanation above as follows:
H_2: There is an influence of Supply Chain Collaboration on Production Technology.

The Relationship between the Concept of Supply Chain Collaboration and New Product Development

Strategic collaborations between two or more independent companies in a particular business enable the creation and development of new products. It will also impact the development of knowledge, technology, human resources, and market sharing, which helps companies to increase their innovation capacity and bring new products to market that, in turn, can improve performance and competitiveness, as well as quickly adapt in a competitive business environment (Ferreira et al., 2020).

Nagashima et al. (2015) empirically analyzed how adaptive collaboration in supply chain management impacts the stages of the product life cycle and product categories. The intensity of supply chain collaboration improves the accuracy of market demand forecasts, and the implications of product maturation improve short-term product cycle forecasts. And vice versa, the findings show that the absence of collaboration negatively affects the accuracy of estimates, product cycles, and product categories. Kou et al. (2018) on 235 project managers, product and supply chain computer electronics and communications manufacturers focused on product launches, proved that IT resources enable the effective increase of NPD activities with their suppliers, and NPD activities play a key role in moderating the relationship between IT-based supply chains and new product performance, lean product launches, product innovation and product development ability and has an important role in achieving competitive advantage, product development ability, because it leads to superior product performance.

Manufacturing companies need to continuously update their product offerings to better meet the needs of customers and be competitive, with increased product introduction, understanding the characteristics of the supply chain and developing new products effectively and efficiently. Such product development decisions need to be designed and managed with the targeted cost, time, and quality factors in mind. Aligning new product development with supply chain management (SCM) should enable manufacturing companies to address issues related to product launches, increase the effectiveness of new product introductions, and improve company performance (Pero et al., 2010). The implementation of innovation strategies and Collaboration Capability (CC) enables companies to improve New Product Performance (NPP) amid global competition (Chen, 2022). Based on the explanation above, the third hypothesis is determined.
H_3: There is an influence of Supply Chain Collaboration on New Product Development.

The Relationship between the Concept of Supply Chain Collaboration and Product Knowledge

Collaboration is a type of relationship that instills mutual trust, open communication, relationship commitment, creates an ever-increasing compatibility between competencies and customers and creates greater added value through the creation of new product development capabilities (Noke & Hughes, 2010). Collaboration competence and partner compatibility are positively related to KIM (Knowledge Integrated Mechanism) and to e-service innovation (Tsou, 2012).

Knowledge sharing is an important strategy not only for physically transmitting knowledge across departments but also for fostering a shared understanding of knowledge transmitted across the supply chain, and there is a significant link between knowledge sharing and organizational performance. The impact of supply chain collaboration and knowledge sharing on the performance of pharmaceutical companies from the perspective of developing countries. Data was taken from a questionnaire distributed to a total of 415 executives in Bangladesh (Haque & Islam, 2018). Product packaging requires strategic decisions in the supply chain, where it is a crucial and complex problem due to increasing consumer awareness of environmental performance and the need for short lead times, both of which positively impact the economic and environmental performance of supply chain players. Packaging logistics knowledge also emphasizes the need for organizational support to manage packaging trade-offs to secure logistics performance. Packaging organizations in product development companies must have strong relationships with logistics, and product development requires external collaboration (Pålsson & Sandberg, 2020).

Manufacturing companies, show that supply chain collaboration has a positive effect on technological innovation and show that collaboration with external agents encourages incremental and radical innovation. Information technology directly enhances both types of product innovation (incremental and radical) indirectly through supply chain collaboration (Jimenez-Jimenez et al., 2019). The collaboration strategy provides a broader perspective with supply chain actors. To achieve a sustainable supply chain, it is necessary to develop the right tools to align with Internal Knowledge Sharing (IKS) and External Knowledge Sharing (EKS) (Mehdikhani & Valmohammadi, 2019). The fourth hypothesis established is:
H_4: The Influence of Supply Chain Collaboration on Product Knowledge.

The Relationship between the Concept of Production Technology and Product Knowledge

New knowledge is applied within the company to improve employees' capabilities and competencies, enabling them to generate new ideas related to the company's products, which can then be applied and exploited by producing innovative products and attracting market interest (Byukusenge & Muene, 2017). In today's business world, various innovations are needed to transform knowledge into new products, process efficiency, and service development (Laraswati, 2020). Swedish manufacturing companies can participate in development projects over two years to identify and analyze how knowledge is integrated into manufacturing technology development projects to build a competitive advantage. The contribution of the research is the analysis of the knowledge integration process that contributes to the development of competitive advantage through the development of unique manufacturing technologies and new knowledge (Bruch, 2017). The application of technology, project complexity, and improvisation in new product launches affects the efficiency of new product financial performance (Gross, 2014). The development of innovative production technologies is significantly related to manufacturing knowledge, engineering knowledge, including design and technology, production systems, and skills (Karagouni, 2018). Based on the relationship between these concepts, the following hypotheses are determined:
H_5: The Influence of Production Technology on Product Knowledge

The Relationship between the Concept of Production Technology and New Product Development

The influence of strategic collaboration and exploration and exploitation capabilities on innovation and new product development, knowledge sharing, and the mediating role of exploration and exploitation as dynamic capabilities in the company, and there is a positive relationship between strategic alliances, innovation, and new product development (Ferreira et al., 2020). New knowledge about the strategic approaches that SMEs can apply to create new product development (NPD) capabilities, enabling change, these findings are proven to show that SMEs use innovation to create their new product development (NPD) capabilities through

various strategies (Noke & Hughes, 2010). Other research results show that strategic collaboration directly and positively influences innovation and new product development, and that it mediates the impact of exploration and exploitation through the moderating role of knowledge sharing (Ferreira et al., 2020). Partnerships with technology centers, consumer assessments of specific products, and store floor layouts are highly relevant to product customization and can be customized (Leite & Braz, 2016). The sixth hypothesis established is:
H_6: The Influence of Production Technology on New Product Development.

The Relationship between Production Technology Concepts and Supply Chain Performance

Improving company performance (Supply Chain Performance) depends on how effectively innovation is implemented and on the readiness of resources to support its implementation. A study conducted by Ar & Baki (2011) states that innovations in products and processes can result in superior performance; this can be measured through sales performance, market share, and profitability. Understanding of product innovation can also enable strong predictions about performance improvement and significantly influence organizational performance, survival, and competitiveness.

Some studies conclude that digital transformation does not have a significant impact on company performance. However, production technology is a highly effective mediator that connects digital transformation with company performance, enabling the design of appropriate strategies to implement strong digital supply chain management, enhance corporate performance, and increase the productivity and durability of SMEs in Saudi Arabia (AlMulhim, 2021).

The findings show that the use of Cloud-powered logistics plays a critical role in achieving better business outcomes in a Lean Production environment. Lean Production is known to have stronger direct and indirect effects on performance through Cloud-Powered Logistics and Supply Chain Integration enabled by this technology. Supply Chain Integration was also found to have a mediating effect on the relationship between Cloud-supported Logistics performance and relationships (Novais et al., 2020). In addition, Industry 4.0 Technology paves the way for improved production efficiency and worker safety while optimizing resource utilization and increasing sustainability. Industrial 4.0 technologies are applied across almost all sectors, but few studies have explored their use in agriculture. The agri-food sector has seen an increase in digitalization projects. Digital food agriculture supply chains will aid autonomous decision-making, increasing visibility through real-time traceability solutions and improving food quality. Industry 4.0 technology in the agri-food supply chain is expected to exacerbate climate change disruptions and further exacerbate the uneven distribution of resources in the agricultural sector. The study highlights various Industry 4.0 technologies and their applications in the agri-food supply chain. Based on the findings of the literature review, this study identifies 10 key performance indicators to support decision-making in a data-centric digital environment (Novais et al., 2020).

Therefore, in this journal, the author has the following hypothesis:
H_7: The Influence of Production Technology on Supply Chain Performance.

The Relationship between the Concept of Product Knowledge and Supply Chain Performance

Product knowledge has a positive and significant influence on performance, innovation has a positive and significant influence on performance, knowledge management has a positive and significant effect on innovation, and knowledge management has a positive and significant effect on performance through innovation mediation variables. Product knowledge is the best strategy for enhancing competitiveness, as it is a strategic resource that enables companies to drive innovation (Kou et al., 2018; Li, 2020).

The findings show that the use of Cloud-powered Logistics plays a critical role in achieving better business outcomes in a Lean Production environment. Lean Production is known to have stronger direct and indirect effects on performance through Cloud-powered Logistics and Supply Chain Integration generated by this technology, and to influence the performance relationship of Cloud-powered Logistics (Novais et al., 2020). In addition, other studies (Lin et al., 2022) show that companies optimize their supply chain resources to develop big data capabilities that contribute positively to company performance.

The hypothesis of Zhang et al. (2018), empirically tested using data from 300 Chinese and 200 Indian manufacturers, found that intellectual capital improves product innovation performance both directly and indirectly through the integration of supplier knowledge. In particular, the direct influence of intellectual capital on product innovation performance is significantly higher in China than in India. In contrast, in India, it improves product innovation performance indirectly by integrating supplier knowledge. The authors also found that integrating supplier knowledge indirectly improves product innovation performance through supply chain adaptability in China and India.

Therefore, in this journal, the author has the following hypothesis:
H_8: The Influence of Product Knowledge on Supply Chain Performance.

The Relationship between the New Product Development Concept and Supply Chain Performance

Jong & Hartog (2008) Innovative Work Behavior is an individual's behavior that aims to reach the stage of introduction or attempt to introduce ideas and processes. Innovation is also one way for companies to leverage employees' creativity and develop ideas for new products and improved service processes, which will further improve the company's performance. Innovation is seen as one of the keys to a company's ability to compete and to its renewal strategy. (Parker & Collins, 2010).

The analysis was based on data collected from 175 Canadian small and medium-sized manufacturing companies (SMEs). The findings show a direct positive influence of the strategy on New Product Development Flexibility (NPDF), a direct positive relationship between NPDF and performance, and a positive total effect (direct and indirect) on performance. (Fantazy & Salem, 2016). Research using data from project, product, and supply chain managers at computer and electronics manufacturers in Taiwan shows that IT advancements influence New Product Development (NPD) and that resources play an important role in shaping new product performance. The study focuses on product launches and product innovation, as they play an important role in achieving competitive advantage, and on product development capabilities, as they lead to superior product performance (Kou et al., 2018). *New product development* is defined as a formal form of access to experience, knowledge, and expertise, creating new products, driving innovation that increases customer value (Valdez-Juárez et al., 2016).

Therefore, in this journal, the author has the following hypothesis:
H_9: The Influence *of New Product Development* on *Supply Chain Performance.*

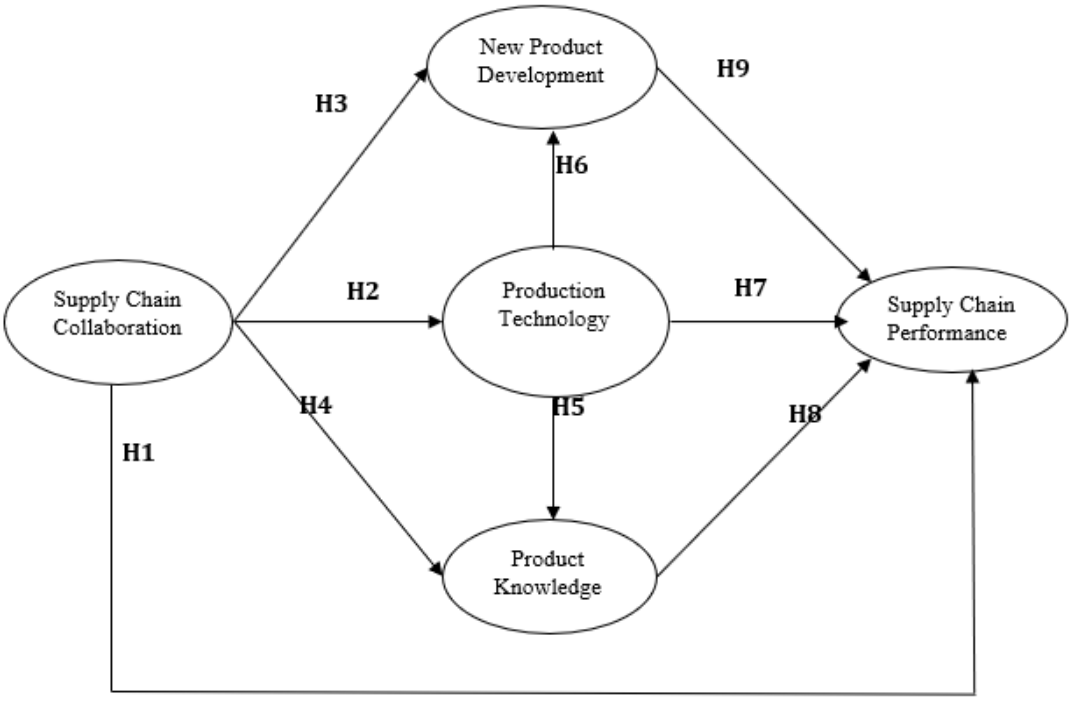

Figure 1. Research Model

Based on Figure 1, the intervening hypothesis can be determined, namely:

H_{10}: Influence *Supply chain collaboration* against *supply chain performance through Production Technology.*

H_{11}: Influence *Supply Chain Collaboration* against *Supply Chain Performance* through *New Product Development.*

H_{12}: Influence *Supply Chain Collaboration* against *Supply Chain Performance through Product Knowledge.*

H_{13}: Influence Supply Chain Collaboration on Supply Chain Performance through Production Technology and New Product Development.

H_{14}: Influence Supply Chain Collaboration on Supply Chain Performance through production technology and Product knowledge.

METHODOLOGY

This type of quantitative research is a method based on concrete data in the form of numbers, measured using statistics as a tool for calculation and analysis, related to the problem being researched to produce a conclusion (Sugiyono, 2018). The use of quantitative methods involves conducting surveys to collect data through statements on questionnaires. The population of this study comprises medium- and large-scale manufacturing companies in East Java with more than 20 employees, totaling 5818 companies. The sample in this study is a manufacturing company in East Java with medium and large scales, and the respondents studied have more than 1 year of experience working in the company and hold managerial or supervisory roles across all fields or divisions in East Java manufacturing companies. This is with the understanding that, at the level in question in each field or division, respondents understand the planning, objectives, and development of the company's collaboration with its partners, leveraging technological capabilities, product knowledge, and new product manufacturing to improve the overall performance of the supply chain.

Data analysis is performed by calculating to address formulated problems or hypotheses, using Smart Partial Least Squares (SmartPLS) software for data processing and analysis. The researcher distributed a Google Form link and a WhatsApp link to employees working in manufacturing companies, and the results of distributing questionnaires to respondents from 148 manufacturing companies were obtained. The characteristics of respondents were divided by position divided into 5 positions, namely respondents who had the position of general manager/director amounting to 17 respondents (11%), managers amounting to 52 respondents (35%), supervisors amounting to 50 respondents (34%), staff officers amounting to 11 respondents (7%), senior staff amounting to 18 respondents (12%). This shows that the majority of respondents are in managerial and supervisory positions because they know the company's condition from both technical and strategic perspectives.

ANALYSIS AND DISCUSSION

Respondents' characteristics based on length of employment in the company. Respondents who had a working period of less than 3 years amounted to 10 respondents (7%), 3 to 5 years amounted to 5 respondents (3%), 5 to 7 years amounted to 5 respondents (3%), and more than 7 years amounted to 128 respondents (86%). This shows that the majority of respondents have worked for a long time, have a good understanding of the company's conditions, and have the ability and adequate work experience in the company's operations. The Validity Test indicates that the loading factor for all measurement items exceeds 0.50. In contrast, the reliability test is assessed using the composite reliability value, and Cronbach's Alpha and AVE are greater than 0.7 and 0.50, respectively, as shown in Table 1.

Validity and Reliability Tests

The validity and reliability testing of the research construct were conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach in SmartPLS. Convergent validity is measured by the outer loading value of each indicator, while reliability is measured using Cronbach's Alpha, Composite Reliability (rho_a and rho_c), and Average Variance Extracted (AVE). The test results are shown in Table 1.

Based on Table 1, all indicators across the five research variables had outer loadings above 0.70, indicating that each indicator met the requirements for convergent validity. The *Supply Chain Collaboration* (SCC) variable has an outer loading ranging from 0.785 to 0.824, an AVE of 0.644, a Cronbach's Alpha of 0.817,

and a Composite Reliability (rho_c) of 0.879. The *Production Technology* (PT) variable has an outer loading between 0.708 and 0.811, an AVE of 0.597, a Cronbach's Alpha of 0.774, and a Composite Reliability (rho_c) of 0.855. The *New Product Development* (NPD) variable recorded the highest outer loading with a range of 0.780 to 0.895, AVE of 0.710, Cronbach's Alpha of 0.897, and Composite Reliability (rho_c) of 0.924. The *Product Knowledge* (PK) variable has an outer loading ranging from 0.814 to 0.888, an AVE of 0.751, a Cronbach's Alpha of 0.889, and a Composite Reliability (rho_c) of 0.923. The *Supply Chain Performance* (SCP) variable has an outer loading between 0.789 and 0.842, an AVE of 0.656, a Cronbach's Alpha of 0.895, and a Composite Reliability (rho_c) of 0.920. The overall values of Cronbach's Alpha and Composite Reliability above 0.70, and AVE above 0.50, indicate that the construct has sufficient reliability and validity for hypothesis testing.

Table 1. Construct Validity and Reliability

Measurement Items	Outer Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Composite Reliability (rho_a)	AVE
Supply Chain Collaboration					
SCC1: Strategic collaboration with external partners	0.789				
SCC2: Sharing product planning information	0.813	0.817	0.879	0.823	0.644
SCC3: Sharing benefits with	0.785				
SCC4 partners: Coordinating with partners in meeting demand	0.824				
Production Technology					
PT1: Technology to produce	0.811				
PT2 products: Internet network for	0.708				
PT3 operations: Information system facilities integrated between	0.782	0.774	0.855	0.777	0.597
PT4 functions: Information technology facilities according to current needs	0.785				
New Product Development					
NPD1: Better product uniqueness than competitors	0.824				
NPD2: Developing new products according to consumer needs	0.888				
NPD3: Engaging consumers in new product development	0.821	0.897	0.924	0.899	0.710
NPD4: Creativity in producing new products	0.895				
NPD5: Responding quickly to customer demands	0.780				
Product Knowledge					
PK1: Technology according to the characteristics of the product	0.884	0.889	0.923	0.889	0.751
PK2: Responding to consumer understanding of the product	0.879				

Measurement Items	Outer Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Composite Reliability (rho_a)	AVE
PK3: Describing the information and benefits of the product	0.888				
PK4: Analysis and monitoring of the product periodically	0.814				
Supply Chain Performance					
SCP1: Regular planning	0.801				
SCP2: Effective and efficient product lead time	0.789				
SCP3: Quality products	0.804				
SCP4: Timely delivery of products	0.805	0.895	0.920	0.896	0.656
SCP5: Adequate service for customers	0.842				
SCP6: Reduce production costs more competitively	0.819				

R-Square Value and Predictive Relevance

The structural model in PLS is evaluated using *the R-Square* value to measure the extent to which the independent variables predict the dependent variables. The results of *the R-Square* calculation are presented in Table 2 below.

Table 2. R-Square Value

Research Variables	R-Square	R-Square Adjusted
New Product Development	0.565	0.556
Product Knowledge	0.555	0.546
Production Technology	0.288	0.281
Supply Chain Performance	0.742	0.731

Based on Table 2, the R-Square value for the New Product Development variable is 0.565 (adjusted R-Square: 0.556), indicating that the predictor variables explain 56.5% of the variation in New Product Development. The *Product Knowledge* variable has an *R-Square* value of 0.555 (adjusted: 0.546), while Production Technology has an R-Square value of 0.288 (adjusted: 0.281). The *Supply Chain Performance* variable has the highest R-Square value of 0.742 (adjusted R-Square of 0.731), indicating that the variables in the model can explain 74.2% of the variation in Supply Chain Performance.

The Q-Square *value* was calculated to measure *the predictive relevance* of the model as a whole with the formula: $Q^2 = 1 – [(1 – 0.565) × (1 – 0.555) × (1 – 0.288) × (1 – 0.742)] = 1 – [0.435 × 0.445 × 0.712 × 0.258] = 0.9644$. A Q^2 value of 0.9644 (> 0) indicates that the model has excellent *predictive relevance*, where the proposed model can explain 96.44% of changes in dependent variables.

Direct Effect Hypothesis Testing Results

Direct effect hypothesis testing was conducted using path coefficient values, T-statistics, and P-values, with bootstrapping. A hypothesis is accepted when the T-statistic > 1.96 and the P-value < 0.05. Full results are presented in Table 3.

H1 Testing: The Effect of Supply Chain Collaboration on Supply Chain Performance

Based on Table 3, the path coefficient for the influence of Supply Chain Collaboration on Supply Chain Performance is -0.003, with a T-statistic of 0.037, which is below the critical value of 1.96, and a P-value of

0.970 (> 0.05). Thus, H1 was rejected, meaning that *Supply Chain Collaboration* did not have a significant direct effect on *Supply Chain Performance* in manufacturing companies in East Java. These results indicate that the influence of supply chain collaboration on supply chain performance is indirect and mediated by intermediate variables such as *Production Technology*, *New Product Development*, and *Product Knowledge*.

Table 3. Direct Effect Hypothesis Test Results

Direct Effect	Original Sample (O)	Sample Mean (M)	T Statistics (|O/STDEV|)	P Values
NPD → SCP	0.283	0.296	2.586	0.010
PK → SCP	0.457	0.455	4.157	0.000
PT → NPD	0.579	0.563	6.038	0.000
PT → PK	0.538	0.524	5.606	0.000
PT → SCP	0.203	0.180	2.174	0.030
SCC → NPD	0.260	0.267	3.371	0.001
SCC → PK	0.302	0.304	4.015	0.000
SCC → PT	0.537	0.513	3.807	0.000
SCC → SCP	-0.003	-0.004	0.037	0.970

H2 Testing: The Influence of Supply Chain Collaboration on Production Technology

The *path coefficient* for the influence of Supply Chain Collaboration on Production Technology was 0.537, with a T-statistic of 3.807 (> 1.96) and a P-value of 0.000 (< 0.05). H2 is accepted, which means that *Supply Chain Collaboration* has a positive and significant effect on *Production Technology*. The company's ability to build strategic partnerships, share product planning information, and coordinate to meet demands encourages the company to improve integrated information systems across internal functions and provide information technology in accordance with current needs. These results are in line with the research of Salehi et al. (2021), Salam (2017), and Jimenez-Jimenez et al. (2019), which state that supply chain collaboration has a positive effect on technological innovation.

H3 Testing: The Influence of Supply Chain Collaboration on New Product Development

The path *coefficient* for the influence of Supply Chain Collaboration on New Product Development was 0.260, with a T-value of 3.371 (> 1.96) and a P-value of 0.001 (< 0.05). H3 is accepted, which means *that Supply Chain Collaboration* has a positive and significant effect on *New Product Development*. The collaboration the company builds with suppliers through information sharing and coordination to create added value can encourage product uniqueness that outperforms competitors and improve the company's ability to respond quickly to customer demands. These results are consistent with the findings of Ferreira et al. (2020), Nagashima et al. (2015), and Kou et al. (2018).

H4 Testing: The Effect of Supply Chain Collaboration on Product Knowledge

The *path coefficient* for the influence of Supply Chain Collaboration on Product Knowledge was 0.302, with a T-value of 4.015 (> 1.96) and a P-value of 0.000 (< 0.05). H4 is accepted, which means *that Supply Chain Collaboration* has a positive and significant effect on *Product Knowledge*. Supply chain collaboration that emphasizes trust, open communication, and knowledge sharing among partners drives the company's ability to provide technology tailored to product characteristics and to describe product information and benefits more clearly. These results are consistent with the research of Noke & Hughes (2010), Tsou (2012), and Haque & Islam (2018).

H5 Testing: The Effect of Production Technology on Product Knowledge

The path *coefficient* for the influence of Production Technology on Product Knowledge was 0.538, with a T-statistic of 5.606 (> 1.96) and a P-value of 0.000 (< 0.05). H5 is accepted. Companies that have integrated

information systems that connect key internal functions with information technology that meets the latest needs have been shown to increase knowledge of product characteristics and benefits and to improve the ability to analyze and regularly monitor products. These findings are in line with the research of Bruch (2017) and Karagouni (2018).

H6 Testing: The Influence of Production Technology on New Product Development

The *path coefficient* for the influence of Production Technology on New Product Development was 0.579, with a T-statistic of 6.038 (> 1.96) and a P-value of 0.000 (< 0.05). H6 is accepted. This coefficient value is the highest among all direct paths in the model, indicating that production technology is a major driver of new product development. Companies that adopt integrated information technology can create products that are more distinctive than their competitors', develop new products in response to consumer needs, and respond to market demands faster. These results are consistent with Ferreira et al. (2020) and Noke & Hughes (2010).

H7 Testing: The Effect of Production Technology on Supply Chain Performance

The *path coefficient* for the influence of Production Technology on Supply Chain Performance was 0.203, with a T-statistic of 2.174 (> 1.96) and a P-value of 0.030 (< 0.05). H7 accepted. Companies that optimally implement production technology, including integrated information systems and the latest technologies, are able to conduct regular planning, improve lead-time efficiency, and provide adequate customer service. This supports the findings of AlMulhim (2021) and Novais et al. (2020) that production technology plays a significant role in improving supply chain performance.

H8 Testing: The Influence of Product Knowledge on Supply Chain Performance

The *path coefficient* for the influence of Product Knowledge on Supply Chain Performance was 0.457, with a T-statistic of 4.157 (> 1.96) and a P-value of 0.000 (< 0.05). H8 accepted. This is the largest direct influence on *Supply Chain Performance* among the mediating variables. The company's ability to provide technology tailored to product characteristics, respond quickly to consumer insights, and conduct regular product monitoring has been shown to contribute significantly to supply chain performance, including regular planning, delivery accuracy, and production cost efficiency. These results are consistent with Kou et al. (2018) and Zhang et al. (2018).

H9 Testing: The Effect of New Product Development on Supply Chain Performance

The *path coefficient* for the influence of New Product Development on Supply Chain Performance was 0.283, with a T-value of 2.586 (> 1.96) and a P-value of 0.010 (< 0.05). H9 is accepted. The company's ability to present unique, superior products to competitors, develop products according to consumer needs, and respond quickly to customer demands has proven to contribute positively to *Supply Chain Performance*. These findings are in line with those of Jong & Hartog (2008), Fantazy & Salem (2016), and Kou et al. (2018).

Indirect Effect Hypothesis Testing Results (Mediation)

Table 4. Specific Indirect Effect Test Results

Specific Indirect Effect	Original Sample (O)	Sample Mean (M)	T Statistics (|O/STDEV|)	P Values
SCC → PT → NPD	0.311	0.294	2.844	0.004
SCC → PT → PK	0.289	0.274	2.803	0.005
SCC → PT → PK → SCP	0.132	0.123	2.490	0.013
SCC → PT → SCP	0.109	0.098	1.737	0.082
SCC → PT → NPD → SCP	0.088	0.087	1.903	0.057
SCC → NPD → SCP	0.074	0.077	2.191	0.029
SCC → PK → SCP	0.138	0.139	2.696	0.007
SCC → PT → PK → SCP	0.246	0.237	3.679	0.000

Indirect effect testing was conducted to assess the mediating roles *of Production Technology*, *New Product Development*, and *Product Knowledge* in the relationship between *Supply Chain Collaboration* and *Supply Chain Performance*. The results of the specific indirect effect test are presented in Table 4.

H10 Testing: The Effect of SCC on SCP through Production Technology

The *path coefficient* for the indirect influence of Supply Chain Collaboration on Supply Chain Performance through Production Technology was 0.109, with a T-value of 1.737 and a P-value of 0.082 (> 0.05). H10 was rejected. This means that *Production Technology* has not been proven to significantly mediate the direct relationship between *Supply Chain Collaboration* and *Supply Chain Performance*. Nevertheless, *Production Technology* has been shown to play an important role in longer mediation chains, as indicated by H13 and H14.

H11 Testing: The Effect of SCC on SCP through New Product Development

The path *coefficient value of the* indirect influence of *Supply Chain Collaboration* on *Supply Chain Performance* through *New Product Development* was 0.074 with a T-value of 2.191 (> 1.96) and a P-value of 0.029 (< 0.05). H11 accepted. *New Product Development* has been shown to significantly mediate the relationship between Supply Chain Collaboration and Supply Chain Performance. Intensive supply chain collaboration drives the development of more innovative products, which in turn improve the supply chain performance of manufacturing companies.

H12 Testing: The Effect of SCC on SCP through Product Knowledge

The path *coefficient for the indirect influence of Supply Chain Collaboration on Supply Chain Performance through Product Knowledge was 0.138,* with a T-value of 2.696 (> 1.96) and a P-value of 0.007 (< 0.05). H12 accepted. *Product Knowledge* significantly mediates the relationship between *Supply Chain Collaboration* and *Supply Chain Performance*. Product knowledge built through supply chain collaboration is key to improving overall supply chain performance.

H13 Testing: The Influence of SCC on SCP through Production Technology and New Product Development

The path *coefficient for the indirect influence of Supply Chain Collaboration on Supply Chain Performance through Production Technology and New Product Development was 0.088,* with a T-statistic of 1.903 and a P-value of 0.057 (> 0.05). H13 was rejected, but a T-statistic close to the critical value of 1.96 indicates a strong tendency toward mediation. Supply chain collaboration encourages the use of production technology, which in turn facilitates the development of new products. Although this dual mediation pathway is not yet statistically significant, its practical contribution remains relevant for manufacturing companies.

H14 Testing: The effect of SCC on SCP through Production Technology and Product Knowledge

The *path coefficient* value of the indirect influence *of Supply Chain Collaboration* on *Supply Chain Performance* through *Production Technology* and *Product Knowledge* was 0.132 with a T-statistic of 2.490 (> 1.96) and a P-value of 0.013 (< 0.05). H14 accepted. The Supply *Chain Collaboration → Production Technology → Product Knowledge → Supply Chain Performance* mediation chain has proven significant. This indicates that the collaboration the company builds with supply chain partners will strengthen production technology capabilities, further enhance product knowledge, and ultimately drive improvements in overall supply chain performance. This mediation pathway is the strongest and most significant among all indirect pathways in this research model.

Summary of Hypothesis Testing Results

Based on all the results of the above tests, it can be concluded that out of the 14 hypotheses proposed, 10 hypotheses were accepted (H2, H3, H4, H5, H6, H7, H8, H9, H11, H12, H14) and 4 hypotheses were rejected (H1, H10, H13, H15 — except for the double mediation table through PT→NPD→SCP). The most prominent

finding is the lack of evidence for the direct influence of Supply Chain Collaboration on Supply Chain Performance (H1), suggesting that the influence of supply chain collaboration is indirect and requires the mediating roles of *Production Technology*, *Product Knowledge*, and *New Product Development*. These findings enrich the supply chain literature by showing the importance of mediation capabilities in optimizing the impact of collaboration on the performance of manufacturing companies in East Java.

CONCLUSION

Based on the research on the influence of supply chain collaboration on supply chain performance through production technology, new product development, and product knowledge, several conclusions can be drawn. Supply chain collaboration can positively impact Production Technology, New Product Development, and Product Knowledge, enabling the company to build supplier relationships by sharing product planning information with partners. The company's ability to coordinate with partners to meet demand and create added value for consumers can impact supply chain performance. Production Technology, which is supported by an integrated information system that integrates internal functions and provides information technology facilities in accordance with needs, can increase New Product Development, Product Knowledge, and supply chain performance. Product knowledge, the company's ability to provide technology tailored to the characteristics of the products produced, and the company's ability to clearly describe the information and benefits of the products produced have an impact on supply chain performance. New product development, along with the company's ability to achieve product uniqueness that exceeds competitors' offerings to meet consumer needs and to respond quickly to customer demands in providing new products, affects supply chain performance. This condition shows that the implications of innovation are one way to develop ideas for creating new products and improving service processes. This research enables practitioners to build collaboration with suppliers to produce high-quality raw materials that support product knowledge and new product development according to customer needs. The theoretical contribution of research in enriching the role of the supply chain in improving product knowledge and new product development.

ACKNOWLEDGMENTS

The authors would like to thank Director of Research and Community Service, Higher Education Indonesia for providing the grant with contract number SP DIPA-O23.17.1.690523/2O23, and to Research and Community Outreach Petra Christian University with contract number 13/SP2H/PT/LPPM-UKP/2023.

REFERENCES

Almulhim, A. F. (2021). Smart supply chain and firm performance: the role of digital technologies. *Business Process Management Journal*, *27*(5), 1353–1372. https://doi.org/10.1108/BPMJ-12-2020-0573

Andini, S. A. (2017). Design and implementation of Supply Chain Management (SCM) at CV Hayati Padang. *Computer Science*, *3*(1), 18–26. https://doi.org/10.22202/ei.2016.v3i1.1514

Ar, I. M., & Baki, B. (2011). Antecedents and performance impacts of product versus process innovation: Empirical evidence from SMEs located in Turkish science and technology parks. *European Journal of Innovation Management*, *14*(2), 172–206. https://doi.org/10.1108/14601061111124885

Baah, C., Acquah, I. S. K., & Ofori, D. (2022a). Exploring the influence of supply chain collaboration on supply chain visibility, stakeholder trust, and environmental and financial performance: a partial least squares approach. *Benchmarking*, *29*(1), 172–193. https://doi.org/10.1108/BIJ-10-2020-0519

Baah, C., Opoku Agyeman, D., Acquah, I. S. K., Agyabeng-Mensah, Y., Afum, E., Issau, K., Ofori, D., & Faibil, D. (2022b). Effect of information sharing in supply chains: understanding the roles of supply chain visibility, agility, and collaboration on supply chain performance. *Benchmarking*, *29*(2), 434–455. https://doi.org/10.1108/BIJ-08-2020-0453

Christopher, M. (2021). *Logistics and Supply Chain Management*. Fourth Edition. Pearson Education Limited

Birasnav, M., & Bienstock, J. (2019). Supply chain integration, advanced manufacturing technology, and strategic leadership: An empirical study. *In Computers and Industrial Engineering*, *130*, 142–157. https://doi.org/10.1016/j.cie.2019.01.021

Byukusenge, E., & Munene, J. C. (2017). Knowledge management and business performance: Does innovation matter? *Cogent Business and Management*, *4*(1). https://doi.org/10.1080/23311975.2017.1368434

Bruch, J. (2017). Knowledge integration in manufacturing technology development. *28*(8), 1035–1054. https://doi.org/10.1108/JMTM-03-2017-0051

Carton, R. (2004). *Measuring organizational performance: an exploratory study by Robert B. Carton* (Under the Direction of Charles W. Hofer). 11(2), 2–4.

Chae, B., Yen, H. J. R., & Sheu, C. (2005). Information technology and supply chain collaboration: Moderating effects of existing relationships between partners. *IEEE Transactions on Engineering Management*, *52*(4), 440–448. https://doi.org/10.1109/TEM.2005.856570

Chand, P., Thakkar, J. J., & Ghosh, K. K. (2020). Analysis of supply chain performance metrics for Indian mining & earthmoving equipment manufacturing companies using a hybrid MCDM model. *Resources Policy*, *68*(May), 101742. https://doi.org/10.1016/j.resourpol.2020.101742

Charisa, A. R. (2015). Designing New Product Development at CV Sekawan Sidoarjo. *Now, 3*(1), 68–74.

Chen, C. Hsiang. (2022). Influence of big data analytical capability on new product performance – the effects of collaboration capability and team collaboration in a high-tech firm. *Chinese Management Studies*. https://doi.org/10.1108/CMS-02-2022-0053

Darmasto, B., Kamaliah, & Agusti, R. (2020). Analysis of company performance measurement using the Balanced Scorecard method. *Journal of Radiation*, *8*(1), 95–104.

Fantazy, K. A., & Salem, M. (2016). The value of strategy and flexibility in new product development: The impact on performance. *Journal of Enterprise Information Management*, *29*(4), 525–548. https://doi.org/10.1108/JEIM-10-2014-0102

Ferreira, J., Coelho, A., & Moutinho, L. (2020). Strategic alliances, exploration and exploitation, and their impact on innovation and new product development: the effect of knowledge sharing. *Management Decision*, *59*(3), 524–567. https://doi.org/10.1108/MD-09-2019-1239

Fuadi, A. (2018). The *effect of partnership on competitive advantage at PT. Servitama Internusa* By: Ainul Fuadi Supervisor: Iwan Nauli Daulay and Prima Andreas Siregar Faculty of Economics and Business Riau University, Pekanbaru, Indonesia Email: ainulfuadi07@gmail. Jom Feb, 1, 1–15.

Gallear, D., Ghobadian, A., & Chen, W. (2012). Corporate responsibility, supply chain partnership and performance: An empirical examination. *International Journal of Production Economics*, *140*(1), 83–91. https://doi.org/10.1016/j.ijpe.2012.01.016

Ghofar, A., Kundarto, M., Sugandini, D., Ekawati, T., & Amalia, B. A. (2020). *Supply chain management perspective: strategic capabilities*. http://eprints.upnyk.ac.id/23916/1/buku abdul ghofar: Manajemen.pdf Perspective

Gross, U. (2014). Fighting the fire: Improvisational behavior during the production launch of new products. *International Journal of Operations and Production Management*, *34*(6), 722–749. https://doi.org/10.1108/IJOPM-08-2012-0306

Hanzaee, K., & Khosrozadeh, S. (2011). The effect of the country-of-origin image, product knowledge, and product involvement on information search and purchase intention. *Middle East Journal of Scientific Research*, *8*(3), 625–636.

Haque, M., & Islam, R. (2018). Impact of supply chain collaboration and knowledge sharing on organizational outcomes in the pharmaceutical industry of Bangladesh. *Journal of Global Operations and Strategic Sourcing*, *11*(3), 301–320. https://doi.org/10.1108/JGOSS-02-2018-0007

Iskandar, A., Possumah, B. T., & Aqbar, K. (2020). The Role of Islamic Social Economics and Finance during the Covid-19 Pandemic. SALAM: *Journal of Social and Cultural*, *7*(7). https://doi.org/10.15408/sjsbs.v7i7.15544

Jane, O. (2011). Analysis of partnership potential as a mode to improve innovation and technology capabilities. *Journal of Business Administration*, *7*(2), 192–205.

Jiménez-Jiménez, D., Martínez-costa, M., & Rodríguez, C. S. (2019). The mediating role of supply chain collaboration on the relationship between information technology and innovation. *Journal of Knowledge Management, 23*(3), 548–567. https://doi.org/10.1108/JKM-01-2018-0019

Jong, J. P. J. D., & Hartog, D. N. Den. (2008). Innovative Work Behavior: Measurement and Validation. *Scientific Analysis of Entrepreneurship and SMEs*, November, 1–27.

Karagouni, G. (2018). Production technologies and low-technology knowledge-intensive venturing. *EuroMed Journal of Business*, *13*(1), 75–85. https://doi.org/10.1108/EMJB-11-2016-0033

Kotzab, H., Teller, C., Grant, D. B., & Friis, A. (2015). Supply chain management resources, capabilities, and execution. *Production Planning and Control*, *26*(7), 525–542. https://doi.org/10.1080/09537287.2014.927932

Kou, T. C., Chiang, C. T., & Chiang, A. H. (2018). Effects of IT-based supply chains on new product development activities and the performance of computer and communication electronics manufacturers. *Journal of Business and Industrial Marketing*, *33*(7), 869–882. https://doi.org/10.1108/JBIM-11-2016-0269

Laraswati, L. (2020). The Influence of the Breadth of Shared Creativity on Innovation Performance Through Product Innovation and Knowledge Sharing as Mediation Variables "Case Study on Silver Craft SMEs in the Kotagede Area, Yogyakarta." *Angewandte Chemie International Edition*, *6*(11), 951–952, 2013–2015.

Leite, M., & Braz, V. (2016). Agile manufacturing practices for new product development: Industrial case studies. *Journal of Manufacturing Technology Management*, *27*(4), 560–576. https://doi.org/10.1108/JMTM-09-2015-0073

Liao, Y., Liao, K., & Hutchinson, R. (2010). A conceptual framework for prototyping outsourcing in new product development: A knowledge-based view. *Journal of Manufacturing Technology Management*, *21*(1), 122–138. https://doi.org/10.1108/17410381011011515

Lin, C., Kunnathur, A., & Forrest, J. (2022). Supply chain dynamics, big data capability, and product performance. *American Journal of Business*, *37*(2), 53–75. https://doi.org/10.1108/ajb-08-2020-0136

Mehdikhani, R., & Valmohammadi, C. (2019). Strategic collaboration and sustainable supply chain management: The mediating role of internal and external knowledge sharing. *Journal of Enterprise Information Management*, *32*(5), 778–806. https://doi.org/10.1108/JEIM-07-2018-0166

Mishra, R., Singh, R. K., & Rana, N. P. (2022). Developing environmental collaboration among supply chain partners for sustainable consumption & production: Insights from an auto sector supply chain. *Journal of Cleaner Production*, *338*(January), 130619. https://doi.org/10.1016/j.jclepro.2022.130619

Nagashima, M., Wehrle, F. T., Kerbache, L., & Lassagne, M. (2015). Impacts of adaptive collaboration on demand-forecasting accuracy across different product categories throughout the product life cycle. *Supply Chain Management*, *20*(4), 415–433. https://doi.org/10.1108/SCM-03-2014-0088

Nitisusastro, M. (2012). *Consumer behavior: From the perspective of Entrepreneurship,* Mulyadi Nitisusastro.

Noke, H., & Hughes, M. (2010). Climb the value chain. *30*(2), 132–154. https://doi.org/10.1108/0144357101018680

Novais, L., Maqueira Marín, J. M., & Moyano-Fuentes, J. (2020). Lean Production implementation, Cloud-Supported Logistics and Supply Chain Integration: interrelationships and effects on business performance. *International Journal of Logistics Management*, *31*(3), 629–663. https://doi.org/10.1108/IJLM-02-2019-0052

Pålsson, H., & Sandberg, E. (2020). Paradoxes in supply chains: a conceptual framework for packed products. *International Journal of Logistics Management*, *31*(3), 423–442. https://doi.org/10.1108/IJLM-12-2019-0338

Parker, S. K., & Collins, C. G. (2010). Taking stock: Integrating and differentiating multiple proactive behaviors. *Journal of Management*, 36(3), 633–662. https://doi.org/10.1177/0149206308321554

Pero, M., Abdelkafi, N., Sianesi, A., & Blecker, T. (2010). A framework for the alignment of new product development and supply chains. *Supply Chain Management*, *15*(2), 115–128. https://doi.org/10.1108/13598541011028723

Prayhoego, C., & Devie. (2013). Analysis of the Influence of Total Quality Management on Competitive Advantage and Company Performance. *Business Accounting Review*, *1*(1–2), 65–74.

Salam, M. A. (2017). The mediating role of supply chain collaboration on the relationship between technology, trust, and operational performance: An empirical investigation. *Benchmarking*, *24*(2), 298–317. https://doi.org/10.1108/BIJ-07-2015-0075

Salehi, R., Ali Asaadi, M., Haji Rahimi, M., & Mehrabi, A. (2021). Information technology barriers in the sugarcane supply chain in Khuzestan province, Iran: A combined ANP-DEMATEL approach. *Information Processing in Agriculture*, *8*(3), 458–468. https://doi.org/10.1016/j.inpa.2020.09.005

Sangtani, V., & Murshed, F. (2017). Product knowledge and salesperson performance: rethinking the role of optimism. *Marketing Intelligence and Planning*, *35*(6), 724–739. https://doi.org/10.1108/MIP-11-2016-0199

Stanton, J. V., & Cook, L. A. (2019). Product knowledge and information processing of organic foods. *Journal of Consumer Marketing*, *36*(1), 240–252. https://doi.org/10.1108/JCM-07-2017-2275

Suharto, R. (2018). Analysis of the Influence of Supply Chain Management on Competitive Advantage and Company Performance. *Journal of Business Accounting Review*, *1*(2), 1–10.

R. & D. Suharto (2013). Analysis of the Influence of SCM on Competitive Advantage and Company Performance. *Business Accounting Review*, *1*(2).

Teng, T., Tsinopoulos, C., & Tse, Y. K. (2022). IS capabilities, supply chain collaboration, and quality performance in services: the moderating effect of environmental dynamism. *Industrial Management and Data Systems*. https://doi.org/10.1108/IMDS-08-2021-0496

Trott, P. (2017). *Models of new product development*. In Innovation Management and New Product Development.

Tsou, H. T. (2012). Collaboration competency and partner match for e-service product innovation through knowledge integration mechanisms. *Journal of Service Management*, *23*(5), 640–663. https://doi.org/10.1108/09564231211269810

Um, K. H., & Oh, J. Y. (2020). The interplay between governance mechanisms and supply chain collaboration and performance in buyer–supplier dyads: substitutes or complements? *International Journal of Operations and Production Management*, *40*(4), 415–438. https://doi.org/10.1108/IJOPM-07-2019-0507

Valdez-Juárez, L. E., Lema, D. G. de, & Maldonado-Guzmán, G. (2016). 10.28945_3455.pdf. *Interdisciplinary Journal of Information, Knowledge, and Management*, 11, 141–176.

Wittmann, C. M., Hunt, S. D., & Arnett, D. B. (2009). Explaining alliance success: Competences, resources, relational factors, and resource-advantage theory. *Industrial Marketing Management*, *38*(7), 743–756. https://doi.org/10.1016/j.indmarman.2008.02.007

Zhang, M., Qi, Y., Wang, Z., Pawar, K. S., & Zhao, X. (2018). How does intellectual capital affect product innovation performance? Evidence from China and India. *International Journal of Operations and Production Management*, *38*(3), 895–914. https://doi.org/10.1108/IJOPM-10-2016-0612