

# Uncertain Supply Chain Management

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## The influence of supply chain quality integration on operational performance through innovation quality integration

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### ABSTRACT

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Sanitary and product manufacturing companies' care in Indonesia is increasingly challenging to carry out production due to limitations caused by the lockdown during the pandemic. The conditions demanded very high and required fast distribution mobility. The company maintains product quality by established standards according to specifications, but the production process time is limited. To maintain product quality, companies must retain supply chain quality integration and innovation quality integration to support Operational Performance. The research uses manufacturing companies focusing on plastic companies with bottle and tube production related to supply packaging health protocol products. Analysis to answer the research hypothesis uses the software SmartPLS. The study results found that internal supply chain quality integration by integrated manufacturing processes positively and significantly affects supplier and customer quality integration. Supply chain integration, which consists of supplier quality integration, internal quality integration, and customer quality integration, impacts increasing product innovation and the number of new products. Supply chain quality integration and innovation quality integration directly influence operation performance. This research enlightens company managers on improving internal capabilities and establishing synergy with suppliers and customers to create innovation, aiming to increase operational performance to compete with the global market and face market fluctuations. Research makes a theoretical contribution to quality development and supply chain integration.

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## 1. Introduction

The Covid 19 pandemic, which began in early 2020 and has continued to date, has not only had an impact on the quality of the world's public health as a whole (Patiro et al., 2022) but has also had an impact on people's behavior, bringing changes to people's habits with the term “New Normal”, affects the use of digital technology starting from the fields of education, business, health and other related economic sectors (Siagian et al., 2021). One of the economic sectors that has had an impact because of this pandemic is industrial manufacturing. The existence of restrictions on community activities and on industries that operate during the implementation of restrictions on community activities period, namely the distinction of critical and essential sector industries that can use, the industry manufacturing was experiencing problems in carrying out the process. The Indonesian Ministry of Communication and Information stated that the pandemic has increased the demand for necessities of life such as food and drink, including sanitation products. Companies are trying to return to normal conditions after disruption to find new ways to maintain sustainability (Hohenstein et al., 2017). The limitations of this process are caused by the number of working hours, the number of workers who are arranged alternately in implementing health protocols, including maintaining distance between workers in manufacturing units, maintaining direct communication, and the obligations of each company in preventing the spread of Covid 19 (Tarigan & Siagian, 2021).

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During the COVID-19 pandemic, sanitary products such as hand sanitizer, wet wipes, and soap experienced a sharp increase, reaching 400% to 600%. This figure is predicted to continue to increase during the pandemic. Patiro et al. (2022) stated that panic buying health products such as medicines and sanitary products occurred during a pandemic. Demand is soaring very high and cannot be matched by the strength supply owned by the producer, including the producer whose job is to produce the packaging for these products (Pirmanta et al., 2021). As a result of the limited production flow in terms of the availability of raw materials and processing, both in terms of product packaging and leading products, the conditions for the availability of sanitary products in the market have worsened and caused stock out for products hand sanitizer, soap, and other hygienic products (Nadif & Vanany, 2021).

The COVID conditions decreased customer demand for most manufactured products, except for products used to anticipate the spread of COVID-19 (Siagian & Tarigan, 2021). Manufacturing companies integrate with external companies and optimize the integration of internal companies to respond to the disruption that occurs (Siagian et al., 2022). Supply chain integration using technology can be used, adjusted, and improved quickly and efficiently by informing suppliers of internal needs (Tiwari, 2020). The information provided uses information technology, which aims to streamline internal company processing times to speed up joint decision-making and is a form of company collaboration with its partners (Phan et al., 2019; Setiawan et al., 2023). Capability consistency and cross-functional integration data in companies that adopt information technology can create supply chain integration (Basana et al., 2022) that is connected strongly and in real-time and impacts operational performance (Ganbold et al., 2021).

The company's internal duty is to plan and forecast conditions that may occur in the market (Tarigan, 2018). It also prepares companies to deal with these problems, including managing communication and production cycles with suppliers and customers (Cheng et al., 2016). Siagian et al. (2021) state that there is a management supply chain that will help the company grow resilience, flexibility, and innovation to improve the company's business performance. Supply chain management manages all processes in a complex chain and constantly improves product quality and customer satisfaction effectively (Truong et al., 2017). Supply chain integration separately impacts a company's operational performance during market uncertainty (Vu et al., 2020). Supply chain quality integration will play an essential role in improving product quality with the help of supplier, customer, and their internal capabilities (Abdallah et al., 2021). Besides that, supply chain quality integration will help companies obtain information such as the availability of raw materials and market preferences that can be used to improve product quality (Chaithanapat et al., 2022). Supply chain integration impacts operational performance through information quality, so good communication occurs between buyer-supplier relations (Chavez et al., 2015; Tian et al., 2021). Supply chain integration can produce innovation capabilities with strong interactions between the company and its supplier partners and customers (Freije et al., 2021; Tarigan et al., 2021). By sharing information and long-term collaboration, supply chain integration can increase firm performance (Chen et al., 2018; Pirmanta et al., 2021).

One of the competitive rivalries built by manufacturing companies is increasing operational performance (Doan, 2020). The current era of disruption puts pressure on manufacturing companies to integrate with suppliers and customers in the face of uncertain conditions (Setiawan et al., 2023). Internal and external integration is called supply chain integration (Sundaram et al., 2018). Supply chain quality management is a combination of three dimensions of upstream processes, including supplier assessment and supplier quality management, downstream integration with customer focus processes, and finally, internal company processes, including product/services design (Quang et al., 2016; Zaid et al., 2023). Hu et al. (2023) stated that the same thing means the supply chain integration has three dimensions: first, supplier integration, which is practice and process into collaboration with suppliers; second, customer integration, practice, process, procedure, and behavior into customer collaboration; third, internal integration is a synchronized process and practice with functional areas in the organization. The ability to collaborate with suppliers impacts the accuracy of raw material delivery and the quality of the raw materials needed. Company integration with suppliers can provide quality raw materials from suppliers to customers in a supply chain flow known as supply chain quality integration (SCQI) (Akhtar et al., 2023). Supply chain quality integration can produce competitive performance by increasing conformance to product specifications and product innovativeness (Zhang et al., 2019). The company's ability to implement SCQI by improving operational performance throughout the company and its supply chain (Cogollo-Florez & Correa-Espinal, 2019). Upstream and downstream integration quality in manufacturing companies to achieve quality improvement is a configuration of SCQI (Huo et al., 2019). Supply chain quality embodies coordination and integration with business processes that involve supply partners in creating added value to increase customer satisfaction (Machado et al., 2020). In addition, another main limitation in SCQI studies is investigating how SCQI practices impact innovation and company performance in achieving long-term competitive advantage (Hong et al., 2019). The company's ability to maintain customer knowledge management by involving customers in generating new ideas and developing the product so that it can have an impact on increasing innovation quality (Chaithanapat et al., 2022). Companies can use internal and external resources to achieve innovative knowledge (Zieba et al., 2017). Shou et al. (2017) stated that supplier and customer integration can produce quality performance products. The customer orientation established in healthcare organizations can impact technological innovation and quality improvement (Cleven et al., 2016). Supply chain integration includes external and internal quality integration (Sundram et al., 2018). Supply chain integration is external supply chain integration consisting of supplier, customer, and internal supply chain integration (Sacristán-Díaz et al., 2018; Basana et al., 2022). Companies must fulfill requests well according to customer needs (Ayoub et al., 2017). Customer needs related to the required products are determined by implementing total quality management (Wijaya et al., 2023).

The company's internal quality integration meets customer demands and provides products with specified quality requirements (Ayoub et al., 2017). Internal quality integration coordinates and communicates between functions within the organization in making products with the availability of raw materials provided by suppliers (Zaid et al., 2023). Supplier quality integration promotes the sharing of resources, information, and technology between suppliers and the internal, thereby increasing the capacity to address external needs (Siagian et al., 2022). Close interaction between internal and external suppliers can improve the accuracy of sharing technology information and raw material supply through internal capacity plans, accelerating production efficiency and flexibility (Tarigan et al., 2021). Supplier integration can improve innovation strategies to increase operational performance (Duhaylongsod & De Giovanni, 2019). Customer Quality Integration is a collection of methods used to manage customer complaints, increase customer satisfaction, and build long-term customer relationships (Ayoub et al., 2017). Customer quality integration leads to improving quality fulfillment services according to customer requirements, improving product design quality, and increasing customer capabilities in knowledge of product quality (Abdallah et al., 2014). Sundram et al. (2018) state that customer quality Integration will result in increased quality, increased innovation, improved new product development processes, and increased competitive advantage.

This information can also help companies innovate to create new products and improve the quality of existing products. Yu et al. (2019) stated that supply chain quality integration, which tends to focus on quality, will provide companies with increased performance and can provide innovation for better product quality. From this explanation, it can also be concluded that both supply chain quality integration and innovation quality will influence operational performance. Besides that, the innovation quality that the company can produce with the supply chain quality integration process will give the company a tendency to perform better in the market. This research sets several objectives, namely, first, to obtain the magnitude of the influence of internal quality integration on supplier quality integration, customer quality integration, innovation quality integration, and operational performance. Second, supplier quality integration influences innovation quality integration and operational performance. Third, customer quality integration affects innovation quality integration and operational performance. Fourth, get the magnitude of the influence of innovation quality integration on operational performance.

## 2. Literature Review

### 2.1. Supply Chain Management (SCM)

The supply chain is a system of organizations, people, activities, information, and resources involved in moving a product from manufacturer to product supplier to customer (Vu et al., 2020). SCM is how the company manages the flow from the production process to the product in the hands of consumers, especially from planning the production process to product distribution (Tarigan & Siagian, 2021). Companies also coordinate internal coordination with the party's supplier and customer and build relationships with their partners to complete the product manufacturing process so that the product can work adequately (Tian et al., 2021). In SCM, the company is also tasked with carrying out inventory management regarding the time and quantity of raw materials, semi-finished goods, and finished goods needed by the company. SCM is an activity to plan and organize all kinds of activities related to the availability of raw materials, production procedures, and logistics management (Tarigan et al., 2019; Siagian & Tarigan, 2021). SCM focuses on a company's ability to provide and respond to demand owned by customers in the marketplace and focuses on providing companies with the information and resources they need to be able to perform improvement continuously related to production and supply chain (Sundram et al., 2018).

### 2.2. Supply Chain Quality Integration (SCQI)

According to Cogollo-Florez & Correa-Espinal (2019), SCQI is an integration activity supply chain that aims to get to a level of improvement in terms of product quality and production processes. Coordination is carried out from the company's internal with external companies, namely supplier and customer, to increase the company's internal capability in making decisions that can help the company achieve the desired level of quality and help the company to be able to improve the existing quality (Huo et al., 2019; Sacristán-Díaz et al., 2018). Like SCI, SCQI is divided into three integrations: internal quality integration, supplier quality integration, and customer quality integration (Zhang et al., 2019; Akhtar et al., 2023). SCQI also greatly emphasizes technology integration and coordination (Machado et al., 2020). Using and coordinating technology and resources owned by the company with customers and suppliers will make various processes or things related to products more accessible. Especially in case improvement and quality development (Hohenstein et al., 2017; Tiwari, 2020).

### 2.3. Internal Quality Integration (IQ)

Internal quality integration is internal integration that focuses on improving the quality of both products and services in the supply chain (Huo et al., 2019). Internal quality integration is a joint process carried out between functions within the company to produce quality products and resolve quality-related problems (Zhang et al., 2019). Internal quality integration will remove barriers between departmental functions and create better changes in day-to-day coordination and implementation (Pirmanta et al., 2021). Internal quality integration is tasked with doing various things, especially in planning and controlling the supply chain of what the company does (Zaid et al., 2023). Internal quality integration performs the function of internal integration and management of product quality and process quality (Setiawan et al., 2023). To measure internal quality integration

indicators conducted by Phan et al. (2019), namely leadership top management to achieve good quality, quality improvement, strategic planning, process control, use of technology, production process control, departmental involvement, quality communication, continuous improvement, and competency improvement.

#### *2.4. Supplier Quality Integration (SQI)*

Supplier integration is a set of activities a company performs with partner suppliers owned by the company (Lo et al., 2018; Tarigan & Siagian, 2021). Supply chain collaboration is formed between companies and external supplier partners in producing quality products (Jimenez-Jimenez et al., 2019). These activities include communication regarding information, production processes, and building relationships related to production carried out by the company (Hu et al., 2023). The purpose of supplier integration is so that the production process carried out by the company can run more effectively and efficiently, such as reducing lead time, production time, and better inventory management (Zhang et al., 2019). Supplier quality integration is supplier integration, which focuses more on improving the quality of production and relationships owned by companies with partner suppliers (Akhtar et al., 2023). Supplier integration reduces waiting time, improves delivery performance, increases flexibility, and improves supply chain practices (Abdallah et al., 2014). The purpose of doing supplier quality integration, in addition to improving product quality (Huo et al., 2019), also includes the reduction of costs needed in a production process, improving the quality of materials, and finished goods, increasing engagement suppliers of in the production process to enhance the company's performance in the market (Phan et al., 2019). Measurement supplier quality integration was used in this study, adopting the indicators of Phan et al. (2019), namely election supplier, prioritizing quality, communication, and technology with supplier, information sharing, involvement supplier in the production process, involvement supplier in problem-solving, and long-term cooperation with supplier.

#### *2.5. Customer Quality Integration (CQI)*

Customer quality integration is an activity of customer integration that the company does in combination with the activity quality management (Zhang et al., 2019). Company relationships with customers, especially in terms of communication, are significant in quality integration (Zaid et al., 2023). In customer quality integration, utilizing information technology and determining systems based on customer information will be very important in improving quality and forming innovation (Phan et al., 2019). According to Chavez (2015), manufacturing companies usually use customer integration to obtain information on customers' preferences and needs. Yu et al. (2019) state that there is a process of customer quality integration the right way; the company will be able to do product development more efficiently, and customer integration, combined with quality management, will help the company improve the innovation capability they have so that it will be easier for companies to determine the right product innovations and find quality innovations to be implemented in the products being marketed (Hu et al., 2023). Measurements for customer quality integration will adopt indicators from research conducted by Phan et al. (2019): the ability to process feedback, speed of response, long-term cooperation, quality information circulation, involvement in design, process, and control oversight quality management.

#### *2.6. Innovation Quality Integration (IQI)*

Chaithanapat et al. (2022) state that innovation relates to the ability to create new ideas and unconventional things. In comparison, quality relates to proper standardization, low error rates, and systematic processes (Wijaya et al., 2023). Innovation quality is how the company's new product can meet the customer's various expectations and needs in the market. Innovation quality is divided into three levels. The first is the product or service level, where the innovation quality of a product is determined by efficiency, cost, reliability, timing, product or service features, level of complexity, value for the customer, level of innovation, and various other things. The second is the process level, where innovation quality is determined by how the company's process for finding and achieving the desired quality level can be realized. The third is the firm level, where a higher level of complexity determines innovation quality, how to determine the right formula to improve quality, and the company's ability to lead internally in forming quality innovations. Innovation in a company is an influential factor in increasing competitiveness. The knowledge-based view shows knowledge as an essential factor in the emergence of innovation (Jin et al., 2015). This knowledge can come from internal sources of the organization, such as employees, or external sources, such as government agencies, consultants, universities, and research institutions (Jimenez-Jimenez et al., 2019; Zieba et al., 2017). Healthcare quality innovation by creating workforce conditions and clinical quality to increase patient satisfaction (Cleven et al., 2016). Indicators to measure innovation quality will be adopted from research by Hong et al. (2019): increasing new product innovation, increasing production efficiency, increasing the use of technology, and increasing the ability of corporate organizations to innovate with quality.

#### *2.7. Operational Performance (OP)*

Operational performance is a measurement of company performance related to the company's operational activities (Tarigan & Siagian, 2021; Tarigan, 2018). Such as meeting production targets, fulfilling requests from customers, improving products and production processes, and ensuring the efficiency and effectiveness of the company in achieving predetermined targets. Operational performance is determined by conformance quality, product quality, product reliability, volume flexibility, customer service quality, delivery reliability, and delivery speed (Cheng et al., 2016; Sundaram et al., 2018). In uncertain

market conditions and operational performance, a company relies heavily on its ability to find ways to meet its targets efficiently and adequately (Abdallah et al., 2021). Setting the suitable production capacity and proper management will determine the company's operational performance (Haq, 2021). Companies producing supply chain quality integration patterns of firm performance are determined by product quality, delivery performance, cost of quality performance, and flexibility performance (Huo et al., 2019). Zhang et al. (2019) stated that the competitive performance obtained by companies from supply chain quality integration is conformance to product specifications, on-time delivery performance, flexibility to change product mix, flexibility to change volume, inventory turnover, cycle time (from raw materials to delivery), product capability and performance, on time new product launch and product innovativeness. Firm performance consists of financial and non-financial performance in generating competitiveness for the company compared to competitors (Tian et al., 2021; Setiawan et al., 2023).

The company's ability to produce output with the maximum amount and minimum cost is the primary benchmark of operational performance, including reduced lead time, ordering time, and delay time in logistics and production (Truong et al., 2017). Indicators from Hong et al.'s research will be adopted to measure operational performance. (2019), namely quality improvement, decreased scrap, increased customer satisfaction, productivity, and the ability to respond to market fluctuations.

## 2.6. Relations Between Concepts

### 2.6.1. Internal Quality Integration to Supplier Quality Integration

In activity supply chain integration, internal integration is the basis for the company to integrate with the supply chain (Hu et al., 2023). Internal quality integration ensures that the internal company has adequate capabilities and resources to process information and implement the information obtained to improve quality. The company's internal capabilities will significantly influence how the company integrates with suppliers (Zaid et al., 2023). Companies must be able to determine and plan what things they need from the party supplier and determine how they will coordinate it with the party supplier (Lo et al., 2018; Siagian et al., 2022). As is internal quality integration support, companies can coordinate systems, technology, and good communication with suppliers (Yu & Huo, 2018). In line with this statement, Huo et al. (2014) also stated that internal quality integration will determine the activity of supplier quality integration carried out by the company. Internal quality integration, which is obtained by forming the functions in our plant work well together and cooperating to resolve conflicts between them when they arise, can have an impact on supplier quality integration by creating cooperative relationships with our suppliers and suppliers to improve their quality (Zhang et al., 2019).

**H<sub>1</sub>:** *Internal quality integration influences supplier quality integration.*

### 2.6.2. Internal Quality Integration to Customer Quality Integration

Yu and Huo (2018) also stated that internal quality integration will influence customer quality integration because the company's internal will determine whether the company can understand the change in demand happening in the market and adjust product quality to changes in the preferences of customers. Internal integration will also help the company communicate with customers and connect the results of these communications internally to be coordinated with the party's supplier (Pirmanta et al., 2021). Ganbold et al. (2021) state that if internal integration is good, the company can take advantage of customer integration maximally. So, the company will also get a competitive advantage and more accurate information (Fiango et al., 2023). In other words, the integration process to improve the quality of products marketed will be more effective, and the company can determine the planning and quality improvement needed to meet the customer's needs faster than its competitors (Wijaya et al., 2023). Problem-solving teams have helped improve manufacturing processes at this plan, and functions coordinate their activities as a form of internal quality integration, capable of producing customer quality integration by increasing our customer's feedback on our quality and delivery performance (Zhang et al., 2019).

**H<sub>2</sub>:** *Internal quality integration influences customer quality integration.*

### 2.6.3. Internal Quality Integration to Innovation Quality Integration

Ayoub et al. (2017) stated that through internal integration, the company will try to make the departments within the company work well together, manage resources, and utilize the information the company gets from the market. Collaboration between departments will make it easier for companies to improve not only product quality but also innovation (Abdallah et al., 2021). Yu et al. (2023) found that internal integration carried out by the company will be able to influence innovation, but this still depends on the size of the company. Freije et al. (2021) also stated that internal quality integration will influence the innovation quality owned by the company. The company's ability to manage the information obtained, inventory management, and product flow from production to the hands of consumers will affect the company's ability to improve the quality of products marketed. Internal integration in companies with real-time connections and integration of all internal functions can impact exploratory and exploitative innovation (Hu et al., 2023). Supply chain collaboration formed by information-sharing, decision

synchronization, and resource-sharing companies can produce exploitative and explorative innovation (Jimenez-Jimenez et al., 2019).

**H<sub>3</sub>:** *Internal quality integration influences innovation quality integration.*

#### 2.6.4. Internal Quality Integration to Operational Performance

Internal quality integration will influence the company's operational performance in terms of speed in responding to the market (Errassafi et al., 2019). Quang et al. (2016) stated that internal integration affects operational performance. This is because the company does joint problem-solving between departments and between partners, and the supply chain tends to be able to increase product flexibility and product quality produced by the company in a period. Internal cooperation will help the company reduce weaknesses in its departments and find solutions together when facing market problems (Yu et al., 2023). In addition, collaboration between departments will help companies rotate internal information better and make it easier for companies to create higher-quality products (Feyissa et al., 2019). Internal integration carried out by the company with our plant's functions to coordinate their activities, work interactively with each other, make an effort to get all team members' opinions, and solve problems can produce operational performance by increasing on-time delivery performance, increasing volume flexibility, inventory turnover and cycle time (Zhang et al., 2019). Internal integration, formed by sharing information and joint decision-making in purchasing, sales, and manufacturing, has no impact on operational performance (Cheng et al., 2016).

**H<sub>4</sub>:** *Internal quality integration has a direct effect on operational performance.*

#### 2.6.5. Supplier Quality Integration to Innovation Quality Integration

Hu et al. (2023) state that supplier integration will help the company innovate and realize the ideas that the company owns. The presence of a supplier will help the company get the resources needed to produce quality new products and improve the quality of existing products (Freije et al., 2021). Supplier quality integration can also affect innovation quality (Lo et al., 2018). A supplier is a source of information and data owned by the company externally and, of course, also has ideas or innovations regarding quality that can be integrated with the supply chain (Haq, 2021). Collaboration between companies and suppliers in innovating and improving quality will give the company more references and ways to realize existing innovations. In doing supplier integration in general, Ayoub et al. (2017) stated that several companies will involve suppliers in planning, product design, and production processes. Hu et al. (2023) found that supplier integration, which is formed by sharing inventory data and demand forecasting, is not able to rely on suppliers to produce exploratory and exploitative innovation. The goal is for the company to build relationships and make the production process more effective and efficient (Zhang et al., 2019). Innovation quality owned by the company will also be influenced by the company's ability to relate with suppliers (Abdallah et al., 2021). Innovation itself is a competitive advantage owned by the company and supplier. Supplier integration in companies can increase the role of innovation strategy in producing internal and external operational performance (Duhaylongsod & De Giovanni, 2019).

**H<sub>5</sub>:** *Supplier integration quality affects innovation quality integration.*

#### 2.6.6. Supplier Quality Integration to Operational Performance

Yu et al. (2019) stated that supplier integration will significantly affect the operational performance of a company. Enterprise integration with suppliers will help companies increase the efficiency and effectiveness of the production process carried out efficiently (Zhang et al., 2019). With a more effective and efficient production process, the company will have a competitive advantage in terms of products and cost (Akhtar et al., 2023). (Duhaylongsod & De Giovanni, 2019) also stated that supplier quality integration will influence a company's operational performance. Cooperation between companies and suppliers, especially in the development of new technology and integration in the technology field, will help companies be more effective in taking advantage of the moment in the market (Tarigan et al., 2021). Errassafi et al. (2019) found that supplier integration affects a company's operational performance. Companies building supplier integration with strategic partnerships and joint planning can increase innovation capability by increasing the variety of new products and process improvements (Freije et al., 2021). Shou et al. (2017) stated that supplier integration can produce quality performance products. Feyissa et al. (2019) stated that supplier integration, implemented as an organizational strategy by building linkages and collaborations, can improve company goals by producing adequate material flow.

**H<sub>6</sub>:** *Supplier quality integration influences operational performance.*

#### 2.6.7. Customer Quality Integration to Innovation Quality Integration

In manufacturing companies, customer integration, both in terms of quality and general integration supply chain, will greatly affect the company's ability to innovate (Freije et al., 2021). Zieba et al. (2017) state that the presence of customers will provide companies with a source of innovation, especially information and knowledge about the needs and demands of the market. Ayoub et al. (2017) stated the same thing that customer integration will influence innovation that the company can

formulate. Yu et al. (2023) stated that customer integration will influence innovation quality owned by the company. Level Customer quality integration will give the company feedback, which is more related to the quality of the product, and this will be used to adjust innovation quality carried out by the company (Hu et al., 2023). So that product quality can be developed to better suit the changing needs of customers in the market. Fianko et al. (2023) state that customer integration involving customers in the production process will help companies create innovations more effectively and efficiently. Customer quality orientation in healthcare organizations can produce quality improvements so that patient satisfaction increases (Cleven et al., 2016).

**H<sub>7</sub>:** *Customer quality integration profoundly affects innovation quality integration.*

#### 2.6.8. Customer Quality Integration to Operational Performance

Errassafi et al. (2019) stated that customer integration affects a company's operational performance. Operational performance is a benchmark for company performance based on how the company can produce products effectively and efficiently and how marketed products attract people's buying interest. Collaboration with customers in planning production will help companies adjust how they respond quickly and efficiently if there are changes in the market (Zhang et al., 2019). According to Shou et al. (2017), customer quality integration will influence the company's operational performance. Integration carried out by the company with parties' customers, mainly by collaborating with customers, will significantly help the company improve quality, delivery, and production costs. Ganbold et al. (2021) stated that customer integration will influence operational performance from various aspects, including product quality and development. Freije et al. (2021) stated that the company's ability to share information with key customers by using information technology can impact product innovation capability by developing product quality. Customer integration is carried out by sharing information with key customers and developing collaborative and joint decision-making, which can improve operational performance (Cheng et al., 2016; Fianko et al., 2023).

**H<sub>8</sub>:** *Customer quality integration effect on operational performance.*

#### 2.6.9. Innovation Quality Integration to Operational Performance

Innovation is one of the variables that companies need to be able to compete in the market and improve their performance (Jin et al., 2015). The company's innovation will greatly influence operational performance because this performance measurement looks at the company's ability to carry out production and other operational activities effectively and efficiently (Doan, 2020). According to Psomas et al. (2018), company innovations in processes and products can affect company performance. Huang et al. (2018) stated that the higher the company's ability to create quality innovations, the better it could improve the operational performance of the company. Tajeddini & Martin (2020) stated that company performance will be influenced by innovations owned by companies related to quality. Innovation quality owned by the company must be supported by creativity, service, and speed in production and product introduction (Yu et al., 2023). Innovation will affect the operational performance of a company if the innovation gives the company an edge over competitors and meets the expectations of customers (Tarigan, 2018). SCM practices on quality improvement can impact operational performance and generate competitive advantages (Truong et al., 2017).

**H<sub>9</sub>:** *Innovation Quality Integration effect on Operational performance.*

#### 2.6.10. Internal Quality Integration to Operational Performance with Mediation Supplier Quality Integration

Collaboration between departments within the company and collaboration between supply chains will facilitate the circulation of information and encourage the possibility of new information being obtained. According to Quang et al. (2016), internal departmental collaboration will make it easier to do planning because internal company information can be rotated more effectively internally (Abdallah et al., 2021). The ability of suppliers to provide quality materials quickly will affect the company's performance in speed, lead time, and moment use. In this case, supplier quality integration affects operational performance. Feyissa et al. (2018) state that the relationships built by companies with the supplier and cooperative and cooperative cooperation in real-time will help companies overcome problems such as lead time, buffer time, and the quality of the production process. In addition, internal companies will also be able to obtain the information needed from the party's supplier regarding the market. These things can help companies meet customers' changing preferences and improve company performance (Cheng et al., 2016).

**H<sub>10</sub>:** *Supplier Quality Integration mediates the influence of Internal Quality Integration on Operational Performance.*

#### 2.6.11. Internal Quality Integration and Operational Performance with Mediation Customer Quality Integration

Internal quality integration will give the company internal capabilities to improve the quality of products and production processes (Tarigan et al., 2021). Adequate support for companies to coordinate between departments will help companies adapt to market changes. Internal companies play an essential role in planning and adjusting products and production to respond quickly to changes in demand (Cheng et al., 2016). Good internal management will be able to reduce lead time and waiting time, and besides that, the company can also do forecasting adequately. The speed and accuracy of the company's

response to changing demand will improve the operational performance of enterprise di pasar (Errassafi et al., 2019). Communication and information from customers will help the company reduce production errors and defects. Engaging customers will help the company improve the efficiency and effectiveness of production and logistics. Customer quality integration will make it easier for companies to make quality adjustments and quality improvements. The company's Operational performance will be judged by the company's ability to respond to wishes and provide good service to customers related to marketed products (Shou et al., 2017; Ganbold et al., 2021).

**H<sub>11</sub>:** *Customer quality integration mediates the influence of internal quality integration on operational performance.*

#### 2.6.12. *Internal Quality Integration and Operational Performance with Mediation Innovation Quality Integration*

Freije et al. (2021) stated that the company's internal ability to process information related to quality and development will help companies innovate. Interpretation related to the available information will help the company discover deficiencies in the product or process owned by the company and then adjust accordingly. Company communication with colleagues will also greatly encourage internal companies to be able to carry out quality innovations. The availability of resources and space for company departments to coordinate with each other using the available information will help companies do things that can improve operational performance (Tarigan et al., 2021). These things will improve the quality of the company's planning and forecasting to the market so that the company can be more responsive and flexible. Besides that, companies can also prepare themselves to face changes that may occur in the market (Quang et al., 2016; Errassafi et al., 2019). Innovation quality will encourage companies to have a competitive advantage that can help to influence operational performance. Psomas et al. (2018) stated that innovation from the side input, such as the technology used in the production process as well as the output product, will help the company attract customers' attention.

**H<sub>12</sub>:** *Innovation quality integration mediates the influence of internal quality integration on operational performance.*

#### 2.6.13. *Connection Internal Quality Integration and Operational Performance with Mediation Innovation Quality Integration and Supplier Quality Integration*

Suppliers will support companies in innovating products and improving product quality. Freije et al. (2021) expressed that suppliers' support in providing raw material needs precisely and quickly will help companies carry out quality innovations. In addition, with the speed and ease of coordination, the company will have more time to carry out production planning and establish relationships with suppliers. Tajeddini and Martin (2020) stated that there is support for companies to innovate by the supplier in the production process and speed delivery of products to the customers, which will give customers higher satisfaction with the company. Based on this description, operational performance can be influenced by internal quality integration. With the influence of supplier quality integration nor innovation quality, the tendency for the company's performance to be better will also increase compared to when it is only influenced by internal quality integration. Innovation itself is one of the company's targets when carrying out internal and supplier integration, so it can be said to improve operational performance. But both are also influenced by the company's internal ability to process and communicate well with suppliers and planning innovations needed by the market (Cheng et al., 2016). Based on this description, the hypotheses that can be formed are:

**H<sub>13</sub>:** *Innovation quality and supplier quality integration mediate and influence internal quality integration to operational performance together.*

#### 2.6.14. *Connection Internal Quality Integration and Operational Performance with Mediation Innovation Quality Integration and Customer Quality Integration*

Chen et al. (2018) stated that when the company has information about the market and can communicate effectively with customers, it will be easier for companies to increase their sales. In other words, the company's operational performance will improve when the company can get adequate information from customers and digest this information correctly. (Fianko et al., 2023) stated that customer quality integration plays a vital role in the creation of quality innovation by the company. Like operational performance, innovation requires adequate information from customers and adjustments to customers' wishes in the market. Although it is possible that customers have adequate ability or knowledge regarding the development of a product, opinions regarding preferences are needed by companies to be able to create new and unique innovations. Many companies can apply customer information to innovate and develop products successfully to improve their performance in the market in various aspects. So, it can be said that customer quality integration and quality innovation will influence operational performance.

**H<sub>14</sub>:** *Innovation quality and customer quality integration mediate and influence internal quality integration to operational performance together.*



Based on the relationship between the concepts that have been formulated, the research model in this study can be seen in Figure 2.1. The pure independent variable in this study is internal quality integration. Temporary supplier quality integration, customer quality integration, and innovation quality will act as mediating variables. Operational performance will be the pure dependent variable in this study. Based on the research model, there are 14 hypotheses divided into nine direct hypotheses and five mediation hypotheses.

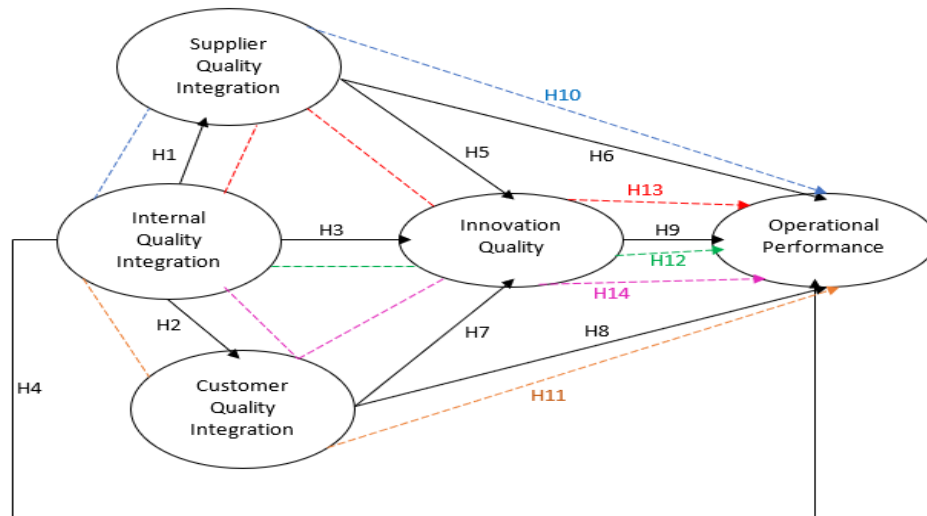


Fig. 1. Research Model

### 3. Research Methodology

In this research, companies engaged in the plastic processing manufacturing industry are used, especially companies that produce packaging in the shapes of bottles, tubes, and labels related to providing health protocol packaging in East Java. The company has been producing packaging from plastic to supply packaging products related to health protocols such as hand sanitizer, personal care, and oral care. A total of 128 questionnaires were distributed, and 72 respondents (56.25%) received responses, 50 of whom met the requirements used in this research data. In contrast, the other 22 respondents did not meet the requirements because they were not companies engaged in health. Data was collected using a Google form questionnaire distributed via social media, WhatsApp, and LINE with the help of colleagues who have connections to companies that meet the study sample criteria. Completion of the questionnaire is targeted at company staff who are at least equivalent to supervisors or have authority in making supply chain and production decisions. To fulfill these requirements, questionnaires were given directly to staff who met the criteria. The answers to the questionnaire using a Likert scale.

The data obtained were tested for validity and reliability and then used to test the research hypothesis. The questionnaire's design has been arranged so that the respondent will answer each available question with only one answer. Characteristics of respondents related to the position obtained by Manager/Director and Owner by 15 respondents (30%), Supervisors and senior staff by 31 respondents (62%), and staff by 4 respondents (8%). Internal departmental involvement in the company in the implementation of quality integration is obtained mainly from the operational/production department at 24%, followed by the Business Development department 20%, Marketing/sales 18%, Engineering 10%, PPIC and Purchasing at 8% and the smallest is the logistics section and QMS/QA/QC each at 6%. From these results, quality integration involves all departments so that data linkages and integration have been confirmed. The characteristics of the company as the object of research are manufacturing companies. Companies that produce plastic in the form of bottles and tubes related to the provision of health protocol packaging, such as hand sanitizer, personal care, and oral care. Other industries such as engineering tool supply, web manufacturing, nonwoven manufacturing, chemical supply, medical devices, ink making, and label manufacturing represent implementation supply quality integration in other business fields that are still related to the provision of the Covid 19 health packaging protocol. Evaluation of the outer model is a measurement model for assessing the validity and reliability of the model, as shown in Table 1. Evaluation of the inner model is a structural model for predicting the causality relationship between latent variables. This evaluation is carried out by looking at the R-square values (Table 2) and Q-square obtained by doing calculations.

**Table 1**  
Test of Measurement Items

Item Measurement	Loading	Mean
<b>Variable Internal Quality Integration</b>		
Composite Reliability 0.933; Cronbach Alpha 0.914 dan AVE 0.606		
Commitment of top managers involved in integrated quality planning (IQI1)	0.681	4.42
Top managers' commitment to engage in integrated quality improvement (IQI2)	0.729	4.52
Internal ability to carry out strategic planning to meet demand (IQI3)	0.759	4.50
Control of the integration process that occurs internally related to quality (IQI4)	0.872	4.46
Use of integrated equipment and technology (IQI5)	0.714	4.48
Integrated manufacturing process monitoring and control (IQI6)	0.897	4.40
Departmental involvement in design quality (IQI7)	0.761	4.56
Handling quality with effective communication (IQI8)	0.786	4.44
Integrated continuous improvement (IQI9)	0.773	4.42
Cross-functional training related to quality (IQI10)	0.786	4.40
<b>Variable Supplier Quality Integration</b>		
Composite Reliability 0.887; Cronbach Alpha 0.831 dan AVE 0.664		
Internal capability in determining a reliable supplier (SQI1)	0.828	4.22
Selection of quality to be the focus for suppliers (SQI2)	0.730	3.90
Sharing information with suppliers using information technology (SQI3)	0.851	4.26
Sharing information related to costs and benefits with suppliers (SQI4)	0.893	4.18
Involve suppliers in quality issues (SQI5)	0.836	4.20
Long-term cooperative relationship with suppliers (SQI6)	0.737	4.38
<b>Variable Customer Quality Integration</b>		
Composite Reliability 0.939; Cronbach Alpha 0.927 dan AVE 0.701		
Internal capability in managing customer feedback (CQI1)	0.881	4.48
Provide a fast and precise response to customer complaints (CQI2)	0.893	4.46
Building long-term cooperative relationships with customers (CQI3)	0.888	4.46
Sharing information related to costs and benefits with customers (CQI4)	0.825	4.32
Involve customers in quality issues (CQI5)	0.667	4.28
Customer participation in monitoring quality and delivered products (CQI6)	0.849	4.32
<b>Variable Innovation Quality Integration</b>		
Composite Reliability 0.939; Cronbach Alpha 0.918 dan AVE 0.671		
Increased product innovation results (INQI1)	0.892	4.44
Number of new products increased (INQI2)	0.542	4.44
The production process can increase production efficiency (INQI3)	0.877	4.58
Ability to improve technology-based administration applications (INQI4)	0.909	4.42
<b>Variable Operational Performance</b>		
Composite Reliability 0.922; Cronbach Alpha 0.900 dan AVE 0.754		
Product quality meets customer needs (OP1)	0.869	4.46
Scrap or rework down (OP2)	0.842	4.34
The number of customer complaints decreased (OP3)	0.903	4.46
Productivity increases (OP4)	0.899	4.36
The company's ability to respond quickly to changes in market demand (OP5)	0.826	4.32

Based on Table 1, each variable indicator is tested for validity convergence by looking at the value loading which are owned. In the first variable, Internal Quality Integration (IQI), loading the lowest is on the IQI indicator with a value of 0.681. This value still meets the minimum requirements of 0.5. So, for variables' internal quality integration, all indicators meet the requirements of convergent validity. The second variable, the Supplier Quality Integration (SQI) score obtained, loaded the lowest on the SQI2 indicator with a value of 0.730. This value is still above the minimum requirement of 0.5. In other words, all indicators on variable supplier quality integration have met the requirements of convergent validity. The third variable, Customer Quality Integration (CQI), was found loading the lowest on the CQI5 indicator with a loading of 0.667. This value is still more than the minimum requirement of 0.5. So, it can be concluded that all indicators are variables of customer quality integration that qualify for convergent validity. The fourth variable, Innovation Quality Integration (INQI), loading the lowest, is the INQI2 indicator with a value of 0.542. Mark loading still meets the minimum requirements of 0.5. So, it can be concluded that all variable indicators of innovation quality meet the requirements of convergent validity. Finally, on variables Operational Performance (OP), the loading value the lowest is the OP5 indicator with a value of 0.826. The indicator value still meets the minimum requirements of 0.5, so it can be concluded that the indicator is a variable operational performance that all meets convergent validity requirements. Likewise, the Average Variance Extracted (AVE) value meets the requirements above 0.5, and the Reliability test meets the requirements above 0.7.

**Table 2**  
R Square Test

Variable	R Square	R Square Adjusted
Supplier Quality Integration	0.221	0.207
Customer Quality Integration	0.231	0.218
Innovation Quality Integration	0.661	0.643
Operational Performance	0.734	0.715

Based on Table 2, by looking at the value R Square for each variable, it can be concluded that the variable operational performance in this study was influenced 22% by variable supplier quality integration, 23% by variable customer quality integration, and 66% by variable innovation quality. While valuing R Square from operational performance, he explained that 73.4% of the change in the variable operational performance was influenced by supplier, customer, and innovation quality integration. At the same time, 26.6% of the variables' operational performance changes were influenced by other variables not used in this study. The R-square value can be calculated to determine predictive relevance or Q-square by 0,9460. Where this value is > 0 and has a value close to 1, it can be concluded that the constructed model of this study is appropriate and has predictive relevance to the strong one. The inner model is also tested for the relationship between the variables in the study using the t-test on PLS. Through the bootstrapping process, the parameters of the t-statistic test are obtained to predict the existence of a causality relationship.

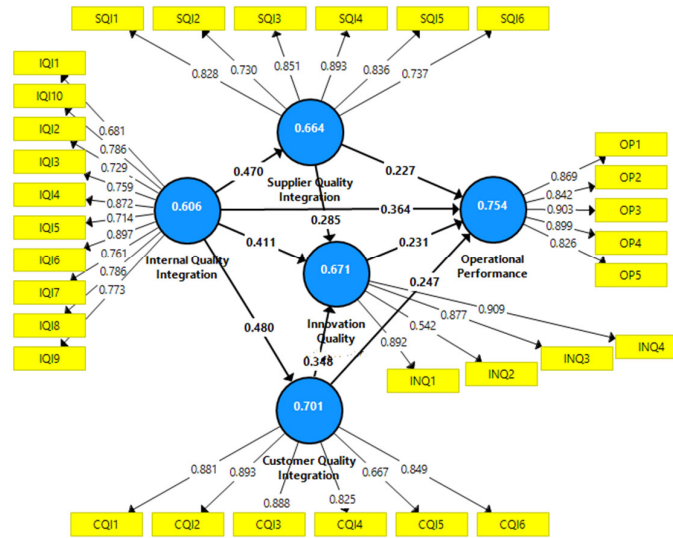


Fig. 2. Path Coefficient

Table 3  
Direct Effect for Hypothesis

No	Hypothesis	t-statistic	p-value	Information
H1	IQI → SQI	4.536	0.000	Accepted
H2	IQI → CQI	5.002	0.000	Accepted
H3	IQI → INQI	4.779	0.000	Accepted
H4	IQI → OP	3.482	0.001	Accepted
H5	SQI → INQI	3.404	0.001	Accepted
H6	SQI → OP	2.429	0.015	Accepted
H7	CQI → INQI	4.353	0.000	Accepted
H8	CQI → OP	2.362	0.018	Accepted
H9	INQI → OP	2.066	0.039	Accepted

Table 3 shows that all direct hypotheses in this study are accepted because they meet the requirements  $\geq 1.98$  and  $p\text{-value} \leq 0.05$ . Hypothesis H1 regarding internal quality integration effect on supplier quality integration value received t-statistic 4.536 and p-value 0.000. In this study, it was found that internal quality integration influences supplier quality integration. These results indicate that the plastic manufacturing companies that were the respondents in this study needed their internals to determine the quality of the SQI they did. Indeed, in general, the company's internal will play an important role related to the company's external integration activities, especially with suppliers. View value loading highest on the indicators of the two variables, namely IQI6, Internal ability to monitor and control the manufacturing process, and SQI4, share information related to costs, benefits and quality with supplier, it can be concluded that the companies that were the respondents generally monitored the production and manufacturing processes they carried out, then communicated what they got with the parties. Supplier they have. Whether it's about costs, benefits, or the product quality to be produced, the results of this study are consistent with research conducted by Hu et al. (2023), Huo et al. (2014), Yu & Huo (2018), Zhang et al. (2019), Zaid et al. (2023), Lo et al. (2018) and Siagian et al. (2022).

H2 about internal quality integration effect on customer quality integration value received t-statistic 5,002 and p-value 0.000. Looking at the highest indicators of the two variables, namely IQI6, Internal ability to monitor and control manufacturing processes, and CQI2, Provide fast and appropriate responses to complaints customer, it can be concluded that supervision and control in the production process carried out by the internal company will be able to help the company to respond to feedback

given by customer. In terms of quality, customers will give feedback in the form of complaints or compliments that need to be considered by the company. In addition, it is also necessary for the company to communicate information about the production process and the products it produces to customers so that customers can understand the company's decisions, primarily related to the quality of the products produced. In line with the research state to achieve a high level of CQI, companies must share quality information and synchronize quality management processes with customers (Yu & Huo, 2018; Pirmanta et al., 2021; Ganbold et al., 2021; Fianko et al., 2023; Zhang et al., 2019; Wijaya et al., 2023).

Hypothesis H3 regarding internal quality integration effect on innovation quality integration value received t-statistic 4,779 and p-value 0.000. See loading highest for each variable, namely IQI6, Internal ability to monitor and control manufacturing processes, and INQI4, Company ability to improve technology-based administrative applications, it can be concluded that internal companies that are able to supervise and control manufacturing processes will help companies to choose the right technology to improve the quality of the products produced and improve the quality of the manufacturing processes carried out. Besides that, the INQI1 indicator, Increased product innovation results, also has a loading high; it can also be concluded that every technological development and increase in innovation that occurs is carried out by the respondent companies by adjusting their needs in the manufacturing process. The results are also in line with the research state the internal company has a role in determining, planning, and implementing the innovations that have been designed (Ayoub et al., 2017; Abdallah et al., 2021; Yu et al., 2023; Freije et al., 2021; Hu et al., 2023; Jimenez-Jimenez et al., 2019).

Hypothesis H4 regarding internal quality integration effect on operational performance value received t-statistic 3,482 and p-value 0.001. View indicators with loading the highest of the two variables, namely IQI6, Internal ability to monitor and control the manufacturing process, and OP3, The number of customer complaints has decreased, and OP4, Productivity has increased, it is obvious that the quality of the products produced will require processes that are also of high quality. With good supervision and proper control, the company will be able to carry out a fast and precise production process and produce products that are quality in accordance with the market needs and expectations of the customer. Productivity will also be better because the company can adjust production to suit its capabilities and increase production efficiency according to the capacity of the production equipment. The results of this study are consistent with several previous studies which states internal quality integration effect to operational performance (Errassafi et al., 2019; Quang et al., 2016; Yu et al., 2023; Feyissa et al., 2019; Zhang et al., 2019; Cheng et al., 2016). Internal quality integration helps to create an atmosphere of total involvement in the company, and everyone takes the initiative to assume responsibility for quality management in different functions to work cooperatively following the same quality standards, thus providing high quality and being competitive in the market.

Hypothesis H5 regarding supplier quality integration effect on innovation quality integration value received t-statistic 3,404 and p-value 0.001. View indicators with loading the highest on each variable, namely SQI4, Sharing information related to costs, benefits and quality with supplier, INQI4, The company's ability to improve technology-based administrative applications, and INQI1, Increased product innovation results, it can be concluded that information and coordination with supplier related to costs, benefits, and product quality will help the company to innovate related to the products produced by the company. In addition, by coordinating with suppliers related to these matters, companies can adjust their administration to access and process the information they receive from suppliers so that the company's planning and manufacturing processes, including reordering point and buffer time, can be arranged, and adjusted by the company. The results of this study align with research conducted (Hu et al., 2023; Freije et al., 2021; Lo et al., 2018; Haq, 2021; Ayoub et al., 2017; Hu et al., 2023; Zhang et al., 2019; Abdallah et al., 2021; Duhaylongsod & De Giovanni, 2019).

Hypothesis H6 regarding supplier quality integration effect on operational performance value received t-statistic 2,429 and p-value 0.015. For the companies that were the respondents, the quality of assistance provided by the supplier will determine the quality of their products and their performance in the market. View indicators with loading the highest of each variable, namely SQI4, sharing information related to costs, benefits, and quality with the supplier, and OP3, Number of complaints customer decreased, it can be concluded that the complaints owned by the customer can be overcome when the supplier can support the company by providing the necessary raw materials and other assistance effectively and efficiently. Complaints from customers can be related to various things. To be able to overcome this, companies will need to coordinate not only internally but also with suppliers. Helping good integration with suppliers related to quality will help the company not only in terms of improving product quality but also the quality of the production process carried out, such as production speed, cost efficiency, and product-level defects. The results of this study are in line with research that was conducted by Yu et al. (2019), Zhang et al. (2019), Akhtar et al. (2023), Duhaylongsod & De Giovanni (2019), Tarigan et al. (2021), Errassafi et al. (2019), Freije et al. (2021), Shou et al. (2017) and Feyissa et al. (2019). PSQI practices (for example, trust, governance, information integration, process integration, and cooperative learning) can improve operational performance and customer satisfaction.

Hypothesis H7 regarding customer quality integration effect on innovation quality integration value received t-statistic 4,353 and p-value 0.000. View indicators with mean the highest on both variables, namely CQI2, Provide a fast and appropriate response in complaints customer, and INQI4, The company's ability to improve technology-based administration applications, as well as INQI1, Product innovation results increased, it can be concluded that the company's ability to respond quickly and appropriately to complaints owned by the customer, will help the company to form the proper administration application.

Companies will find it easier to find out how to deal with complaints that are made by customers and can make administrative data based on the experience they have. The results of this study are in line with research conducted by Freije et al. (2021), Zieba et al. (2017), Ayoub et al. (2017), Yu et al. (2023). Hu et al. (2023), Fianko et al. (2023), and Cleven et al. (2016). Enterprise innovation will be significantly influenced by customers. Companies need to coordinate and get information from customers regarding expectations or complaints from customers of products already on the market. Through this information and expectations, the company will coordinate with suppliers and internally regarding how the company will innovate product quality. Companies can also innovate exploratively and exploitatively depending on how the company can trigger innovation quality integration.

The H8 hypothesis regarding the effect of customer quality integration on operational performance value received a t-statistic of 2.362 and a p-value of 0.018. In this research, we examine the effect of customer quality integration (CQI) on an operational performance (OP) company. This shows that the companies that are the respondents in this study will coordinate with the customer and carry out operational activities based on information or requests owned by the customer. The company will also try to fulfill and regulate the production process according to the customers' preferences regarding the product. Seeing the highest indicator of the two variables, namely CQI2, "Provide a fast and appropriate response in complaints to customers" and OP3, "Number of complaints customer decreases," the two indicators are related. The company's performance is assessed by looking at the response from customers and how the company can meet the changing demands in the market. This included making products that are quality to the needs of the owner's customer. The results of this study are in line with the results of research by Errassafi et al. (2019), Zhang et al. (2019), Shou et al. (2017), Ganbold et al. (2021), Freije et al. (2021), Cheng et al. (2016), and Fianko et al. (2023), where operational performance is measured by the service level of customer overall, which includes product quality, product support, delivery reliability, service customer pre-sales, delivery speed, and volume flexibility. This measurement shows that operational performance is not only closely related to the production process and other operational activities of the company but also to how the company performs services and fulfills the needs of the customer, both at the time of production delivery and after the customer receives the product.

Lastly, the H9 hypothesis regarding innovation quality integration effect on operational performance value received a t-statistic 2.066 and a p-value of 0.039. If we see an indicator with loading the highest on both variables, namely INQI4, the company's ability to improve technology-based administration applications, and OP3, Number of complaints of customers decreased, and it can be concluded that the availability of innovations owned by the company aims to reduce complaints owned by the customer. To do this, companies need to improve their administrative capabilities using technology so that they can access information about customers' complaints and wishes. Based on this information, the company can innovate appropriate processes and products according to what is desired or needed by the customer. This study's results align with those of Jin et al. (2015), Doan (2020), Psomas et al. (2018), Huang et al. (2018), Tajeddini & Martin (2020), Yu et al. (2023), Tarigan (2018) and Truong et al. (2017), which state that how companies can get information and process it into innovation will determine the quality of the innovations produced. This will then affect the operational performance of the company. Innovation from the production and product side will give the company an advantage, especially if the company is in a market that has intense competition. This research model also found an indirect influence effect (Table 4). Influence indirect effect in this study in the form of a mediating effect given by the variable supplier quality integration, customer quality integration, and innovation quality integration.

**Table 4**

Indirect Effect

No	Hypothesis	t-statistic	p-value	Information
H10	IQI → SQI → OP	2.328	0.020	Accepted
H11	IQI → CQI → OP	2.130	0.033	Accepted
H12	IQI → INQI → OP	1.902	0.057	Rejected
H13	IQI → SQI → INQI → OP	1.271	0.142	Rejected
H14	IQI → CQI → INQI → OP	1.820	0.069	Rejected

Based on Table 4 of the H10 hypothesis regarding supplier quality integration, the mediate influence of internal quality integration on operational performance value received a t-statistic of 2,328 and a p-value of 0.020. In this research, Supplier Quality Integration (SQI) mediates the influence of Internal Quality Integration (IQI) against Operational Performance (OP). Quang et al. (2016) stated that the company's internal duties are to carry out planning, coordination, communication, and perform the production process. This will affect how the company performs in the market. A temporary supplier's role in providing raw materials at a low cost and in a fast time is to help the company have better operational performance in terms of quality, time, and cost. Based on the direct influence of this study, it can be concluded that a good company's manufacturing activity monitoring will be communicated with suppliers, especially in terms of costs, benefits, and quality. So that companies can improve the quality of their manufacturing activities and become more qualified. With good supervision and communication regarding the manufacturing process with suppliers, it will be easier for companies to lower complaints from customers and improve operational performance. This research supports the research results of Quang et al. (2016), Abdallah et al. (2021), Feyissa et al. (2018) and Cheng et al. (2016).

The H11 hypothesis regarding customer quality integration mediates the influence of internal quality integration on operational performance value received t-statistic 2,130 and p-value 0.033. Suppose you look at the direct effect of IQI and CQI on OP in this study. In that case, it can be said that companies need to provide fast and appropriate responses regarding feedback from customers and reduce the number of complaints held by customers. Companies can offer a fast and appropriate response if they know where to adjust. Reasonable monitoring of manufacturing activities will provide companies with information that can help companies improve the quality of responses given to complaints from customers. This study confirms the research results Tarigan et al. (2021), Cheng et al. (2016), Errassafi et al. (2019), Shou et al. (2017), Ganbold et al. (2021).

While the rejected hypothesis is, the H12 hypothesis regarding innovation quality integration mediate influence internal quality integration to operational performance rejected by value t-statistic 1,902 and p-value 0.057. Huang et al. (2018) and Psomas et al. (2018) stated that innovation is essential for companies to improve their performance in the market. Be it from the side output as well as process and input. However, when compared to the conditions of most respondents in this study, the innovations carried out were not purely internal to the company. Instead, they tend to demand from the market or customers who order goods from the company. Thus, innovations carried out by internal companies tend to be less significant operational performance company when combined with internal quality integration. Innovation can mediate and influence internal quality integration on company performance if innovation plays an essential and significant role (Hu et al., 2023). This is different from the condition of the companies that were the respondents in the study. Apart from the fact that most of the respondent companies only followed the requests of customers, innovation is no more needed than production performance owned by the company. It can also be concluded that the respondent's company only needs to have internal quality integration or innovation quality integration influencing operational performance because when a company can control each stage of the production process, it is enough to make the company's performance even better. Likewise, if companies can maximize the technology they have administratively, this can improve operational performance.

Hypothesis H13 regarding innovation quality integration and supplier quality integration jointly mediate influence internal quality integration to operational performance rejected by value t-statistic 1,271 and p-value 0.142. Variable internal quality integration is illustrated through two indicators with the highest factor loading, namely, the company's internal ability to monitor and control manufacturing processes (IQI6) and the company's ability to control processes that occur within the company related to quality (IQI4) which can have an impact on internal quality integration. The company's internal ability to be actively involved in improving quality is reflected in improvements in operational performance, which include a decreased number of customer complaints (OP3) and increased productivity (OP4). The company's ability to improve operational performance cannot be separated from the company's ability to develop new products and good relations with suppliers as providers of raw materials and auxiliary materials. However, in this study, developing new products and relationships with suppliers is not significant enough. This is reflected in the large number of new products produced (INQI2) that get loaded and the selection of raw materials and supporting materials that prioritize quality over price (SQI3), which get the lowest factor loading on variables Innovation Quality Integration and Supplier Quality Integration. Tajeddini and Martin (2020) state that company innovation requires the support of creativity, service, and speed of the production process. In addition, they also need help from customers to be able to make the right innovation. This shows that the internal company requires the support of all internal parties' supply chains, not just party suppliers, to be able to innovate precisely and create operational performance able to compete in a changing market.

Hypothesis H14 regarding innovation quality integration and customer quality integration jointly mediate influence internal quality integration to operational performance rejected by value t-statistic 1,820 and p-value 0.069. Even without adequate supplies, the company experienced difficulties realizing innovation quality integration, which is owned. Tian et al. (2021) also stated the same thing, that supply chain integration tends to need one another to be able to improve company performance. Temporary innovation can be created according to the demand of customers, so it needs support from internal suppliers and customers so that the innovations created can compete with market conditions and the supply chain of the internal company.

## 5. Conclusion

Supplier quality integration, customer quality integration, and innovation quality integration each significantly influence internal quality integration. Each variable can make a positive contribution that has an increasing impact on the company's operational performance. The significant positive impact of each variable can be demonstrated by top management's commitment to planning and quality improvement efforts by monitoring and controlling internal processes involving suppliers and customers to increase sustainable innovation and operational performance with reduced complaints. Customers, reducing rework and the ability to meet changing market needs during the COVID-19 Pandemic. Seeing the impact of internal quality integration on operational performance through supplier quality integration, customer quality integration, and innovation quality integration, companies need to review and choose suppliers, prioritizing quality over purchase prices. This is because companies must be able to face market changes that require fast, precise, and quality supplies to compete competitively with their competitors. In addition, customer involvement is required in problems or issues of quality that occur in the company's supply chain, thus impacting on the company's continuous improvement. The research results show that internal quality integration has the lowest average compared to the other four variables. This shows that there is still potential for companies

to improve the resilience of their supply chains to survive a crisis and return to their original condition quickly. Operational performance has the highest average compared to the other four variables. Companies must maintain and increase their competitive advantage to face market changes.

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