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Effect of Supplier–Buyer Collaboration, Product Innovation, Process Innovation, and Quality Management Adoption on Firm Performance

Ronaldo Richard Gunawan, Hotlan Siagian*, Zeplin Jiwa Husada Tarigan
School of Business and Management, Petra Christian University, Jalan Siwalankerto 121-131 Surabaya, Indonesia
*Corresponding author; E-mail: hotlan.siagian@petra.ac.id

Abstract

Cooperation between companies, such as manufacturers and suppliers, can stabilize raw material procurement, ensuring the production process meets customer needs. Companies need to adopt quality management to innovate processes and products and achieve good performance. This study aims to examine the influence of supplier-buyer collaboration on firm performance through product innovation, process innovation, and Quality Management Adoption. Distribution of questionnaires to 103 manufacturing companies in East Java using purposive sampling techniques. The results of data processing using PLS version 4 software found that supplier-buyer collaboration has a direct influence on quality management adoption and innovation processes, but not on product innovation. The quality management adoption that is formed has a direct impact on the innovation process, product innovation, and firm performance. Companies that innovate processes can also innovate products, thereby further improving company performance. Periodic product innovation can enhance a firm's performance. The practical contribution of this research provides top management with insight to commit to building sustainable collaboration with suppliers to support innovation processes and quality management systems. It is recommended that companies adopt the ISO system to implement a standard quality system as needed. Terrorist contributions can strengthen the integration of quality management and supply chain management within the framework of a resource-based view.

Keywords: Supplier-Buyer Collaboration, Quality Management Adoption, Process Innovation And Product Innovation, Firm Performance.

1. Introduction

As outsourcing practices develop, businesses in any field are increasingly dependent on parties outside their companies to be more involved in the business process (Li et al., 2021). To determine whether a company can collaborate with another, trust is required. In addition to trust, for the relationship to last, openness and honesty are also needed (Nassar et al., 2020). The buyer's ability to accurately predict whether a supplier is trustworthy will be indispensable for exploring the early stages of initiating the buyer-supplier relationship (Seyedghorban et al., 2020). Trust can be built through effective coordination between the two parties. One of the defining aspects of research on buyer-supplier behavior is coordination, manifested in communication (Gesell et al., 2021).

The company strives to create a competitive advantage by focusing on its unique value to maintain strong collaboration with external partners, namely suppliers and customers (Li et al., 2022). A good relationship between suppliers and buyers can be sustained in the long term through a contract agreed upon by both parties. The contract established between the two parties already aligns with the mutually beneficial needs and goals (Seyedghorban et al., 2020).

The company's ability to build relationships with suppliers or, conversely, with buyers is the key to fulfilling the agreements set to provide satisfaction to both parties (Wu et al., 2023). The ability of companies to actively and intensively build communication can provide high-quality information and, as needed, impact company performance (Gesell et al., 2022; Da Silva et al., 2024). Buyers are expected to be highly active in finding suppliers and making selections to suit their needs, and suppliers are expected to perform as expected (Seyedghorban et al., 2020). Companies can establish strong interactions with suppliers so that all the information needed by buyers is shared, enabling buyers to make appropriate assessments (Gesell et al., 2021).

The ability of buyers to build strong relationships with suppliers affects the implementation of Total Quality Management (TQM), which, in turn, has a significant impact on the company's sustainability and its ability to establish relationships with customers. Research has found that satisfaction is positively related to good communication between buyers and suppliers (Agarwal, 2020). Along with technological advances and societal needs, it has created diverse customer demands for high quality, enabling companies to maintain the production process as a requirement for implementing TQM (Acquah et al., 2022). If TQM is implemented in the company, it will increase customer satisfaction because the quality of the goods or services produced improves (Pellegrino et

al., 2020). It is therefore not surprising that many companies are now competing to implement TQM to achieve better performance.

Today's quality practices have begun to change, from quality control to quality management. Many aspects have been applied in TQM, including relationship management with suppliers, sharing information and data according to company conditions, building trust between both parties to understand needs, and interdependence between suppliers and customers in long-term relationships (Pellegrino et al., 2020). The implementation of TQM has proven to be successful in many companies. At least TQM has helped many companies in various sectors in various parts of the world in terms of (1) increasing competitive advantage, (2) increasing adaptability in an uncertain market era, (3) improving productivity and performance, (4) improving the company's reputation, (5) reducing costs and improving the quality of management, (6) increasing the company's revenue and (7) increasing customer satisfaction and loyalty (Benzaquen & Narro, 2022). TQM plays a strong role in building relationships across functions within the company and in sharing knowledge to improve employee and management competencies, thereby providing the right strategy for the future to maintain business continuity (Asante & Ngulube, 2020). TQM implemented in manufacturing companies can improve product quality and empower functions to maintain quality (Green et al., 2019) jointly.

Previous research has found a reciprocal relationship between TQM and product innovation across several industries in Tunisia (Khalfallah et al., 2021). Entrepreneurs now need to constantly innovate their products or services to meet rapidly changing consumer demands (Tang et al, 2023). Companies need to use all available resources to adapt to this rapid change, especially as information technology continues to grow exponentially. In the current era, with the emergence of various technologies such as the Internet-of-things (IoT), blockchain, and artificial intelligence (AI), many companies are innovating with the availability of new knowledge more widely, no longer only to suppliers, customers, and competitors, which is a conventional source for knowledge of information (Kesidou et al, 2022). In today's competitive, rapidly transforming global landscape, new products and processes are inevitable. In contrast, existing products and services deemed essential will quickly become obsolete due to rapid change (Costa et al., 2022).

The performance of innovation itself cannot be separated from the information shared among partners and the company's ability to integrate existing knowledge from various sources to carry out product innovation (Kesidou et al., 2022). Companies can build an integrated information system to quickly provide information to external partners, enabling it to be widely adopted and used by many businesses (Siagian et al., 2023). Existing information needs to be combined with technology to make it more useful and more widely used. With the rapid development of technology, companies can now experience increased growth and develop new products to meet market needs (Tang et al., 2023). Companies can innovate products that play an important role in meeting customer needs and in developing potential markets (Costa et al., 2022). Digital-based information technology can produce process and product innovations to improve company performance (Basana et al., 2023; Tang et al., 2023).

The effectiveness of implementing sustainable supply chain management practices will be optimal when there is a complete understanding of the interactions among supply chain parties (Sayed et al., 2017; Tarigan et al., 2021; Kaur et al., 2019). Empirical studies indicate that operational performance will be significantly impacted by integrating supply chains that prioritize customer interests and supply quality management. A company's business performance is closely tied to how it manages its supply chain practices. Many companies have realized that the crucial source of competitive advantage and improved business performance lies in a strong supply chain (Green et al., 2019; Negi, 2021). The new environment and the rapid changes occurring will have a significant impact on business performance (Sturm et al., 2023).

The research explored above shows the importance of supplier-buyer collaboration in driving innovation and adoption of quality management, which ultimately improves company performance. However, some recent research suggests that the relationship is not always consistent. Ladipo et al. (2022) found that collaboration with suppliers does not significantly affect radical product innovation, suggesting that collaboration intensity does not always guarantee innovation success. Delgado-Verde and Díez-Vial (2024) show that supplier involvement in new product development does not significantly influence the efficiency of the innovation process or the effectiveness of product innovation in the market when it is not accompanied by broader external research collaboration. Furthermore, Sang et al. (2024) emphasized that supplier participation in product development does not necessarily increase product innovation performance, as the mediating effect through absorptive capacity is found to be insignificant. These findings indicate that the relationship between supplier-buyer collaboration and innovation performance is contingent on internal

and external factors within the company. Therefore, further research is needed to examine the mechanisms by which supplier-buyer collaboration simultaneously affects product innovation, process innovation, and quality management to improve firm performance. This study seeks to fill this gap by examining the mediating role of three forms of innovation in the relationship between quality management and supplier-buyer collaboration.

Based on the explanation above, the purpose of the research is to determine whether supplier-buyer collaboration leads to process innovation, product innovation, and improved quality management. Second, get the magnitude of the influence of process innovation on product innovation, quality management, and company performance. Third, get the significant influence of product innovation on quality management and company performance. Finally, getting the magnitude of quality management on company performance.

2. Literature Review

2.1. The Relationship between Supplier-Buyer Collaboration on Quality Management, Process, and Product Innovation

Supplier buyer collaboration can see suppliers fully contribute to carrying out the product requirements needed by the company in order to implement quality management (Da Silva et al., 2024). Supplier buyer collaboration in carrying out activities together in order to produce quality raw materials and affect total quality management (Seyedghorban et al., 2020; Agarwal, 2020). The company's information technology can foster strong supplier-buyer collaboration to drive regular process and product innovation (Basana et al., 2023). Supplier buyer collaboration can provide process innovation for companies because it can provide raw materials that meet their needs (Fan & Stevenson, 2018; Da Silva et al., 2024). Good collaboration between buyers and suppliers in garment companies can facilitate the adoption of quality management practices and enable process innovation, leading to reduced production defects (Hoque & Maalouf, 2022). Buyer-supplier collaboration offers companies opportunities to increase process and product innovation through supplier involvement (Patrucco et al., 2019). The company's ability to consistently build strong communication with suppliers can positively impact the company's adoption of a robust, regular quality management program (Asante & Ngulube, 2020). The use of technology in companies can support better quality management adoption by bridging information sharing with company suppliers to foster collaboration (Chen et al., 2022). Collaboration between companies, as buyers and suppliers, can facilitate information and knowledge sharing to enable innovation and the development of new products (Solaimani & Van der Veen, 2022). The ability of companies as buyers to build collaborative relationships with suppliers and leverage their bargaining power can drive product innovation in value creation and appropriation (Huang et al., 2023). Collaborations within companies can lead to product innovations that meet customer needs (Jimenez-Jimenez et al., 2019). Long-term collaboration between companies and suppliers can sustain innovations that have been adequately planned (Vieira et al., 2022).

H_1: Supplier-buyer collaboration affects quality management.

H_2: Supplier–buyer collaboration affects process innovation.

H_3: Supplier-buyer collaboration affects product innovation.

2.2. The Relationship between Quality Management Adoption and Process and Product Innovation

Quality management practices in companies by empowering all employees to innovate processes in the automotive engineering sector in Nigeria (Abdi & Singh, 2022). Adopting TQM (Total Quality Management) in construction companies can ensure the timely availability of materials from suppliers, thereby facilitating adequate process innovation (Egwunatum et al., 2022). The established quality management system can drive process innovation by streamlining processes and reducing errors (Hudnurkar et al., 2022). The company's ability to adopt quality management to drive improvements and provide resources to develop process and product innovations that suit their needs (Sharma & Modgil, 2020).

Companies can involve all components of the company in implementing TQM to produce quality products and processes that meet standards (Acquah et al., 2022). TQM, when implemented across all company components, can drive product innovation in Tunisia (Khalfallah et al., 2021).

H_4: Quality management adoption affects process innovation.

H_5: Quality management adoption has an impact on product innovation.

2.3. The Relationship between the Process Innovation Process and Product Innovation

Abdelaziz et al. (2023) stated that process innovations carried out by companies to achieve product-process results help meet production needs.

Process innovation in companies by sharing ideas in carrying out knowledge sharing by considering the value of innovation by producing product innovations (Santos et al., 2023). Innovations developed within companies with suppliers that play an important role in building strong relationships can lead to sustainable product innovation (Patrucco et al., 2019). A strong, established relationship between a company and its suppliers can provide high responsiveness and flexibility, enabling operational performance improvements through process innovation and conflict resolution, and alignment on the process (Verghese et al., 2020). Companies can implement a continuous innovation process across various stages and generations to sustain product innovation (Severo et al., 2020). The company's ability to design business process innovations in product development to produce a range of products that meet customer needs (Piñera-Salmerón et al., 2023).

H_7: Process innovation affects product innovation in manufacturing companies.

2.4. The Relationship between Quality Management Adoption and Firm Performance

The involvement of all company departments, including external partners, in implementing total quality management can improve the company's performance (Ahinful et al., 2023). Chen et al. (2022) state that the company's quality management system can drive progressive innovation in producing diverse products and adding value to the company. TQM, as a quality management system, can effectively accommodate companies' needs to improve product quality and innovation (Ershadi et al., 2019). Companies can jointly implement quality management and supply chain practices to develop high-quality product innovations (Soares et al., 2017). Firmansyah and Siagian (2022) found that supplier quality management affects supply chain performance. Quality management within the company, when synergized with the supply chain, can improve company performance and increase customer satisfaction with products (Kaur et al., 2020). The company's management is committed to implementing TQM by improving product quality and achieving sustainable organizational effectiveness (Lepistö et al., 2022). A quality management system, coupled with a company culture, can drive performance through quality products and customer satisfaction (Saleh et al., 2024).

H_6: Quality management adoption affects the company's performance.

2.5. The relationship between Process Innovation and Product Innovation to the Firm Performance

The use of new technology in companies, through process changes as an innovation process, can produce new products that improve company performance and competitive advantage (Abdelaziz et al., 2023; Novijanti et al., 2023). A predetermined orientation strategy guides the company's innovations and can increase firm performance (Reyes-Gomez et al., 2024). Abdelaziz et al. (2023) and Tarigan (2018) stated that companies can innovate products to meet market demands and external customers. The company's performance has increased profitability and cash flow through continuous product innovation (Ameyibor et al., 2022). Companies can use modern technology to make process and product changes, producing products that meet market needs and providing added value to customers (Vilkas et al., 2022). Companies can continuously develop systems that suit their conditions, enabling them to adjust processes and innovate those that impact company performance (Basana et al., 2024). The company's innovation strategy involves all functions to develop new products that meet customer needs (Matekenya & Moyo, 2022). The results show that supply chain integration significantly influences responsiveness, innovation capability, and operational performance (Johono & Siagian, 2022). The company's strategy for product innovation involves involving all components of the program to improve performance and increase customer growth (Ko et al., 2020).

H_8: Innovation process affects the company's performance.

H_9: Product innovation affects the company's performance.

The relationship between constructs is illustrated in Figure 1. This study uses the SEM model to examine construct relationships; however, we focus only on the direct relationships to align with the study's title. The role of each mediating role will be addressed in further study of this topic.

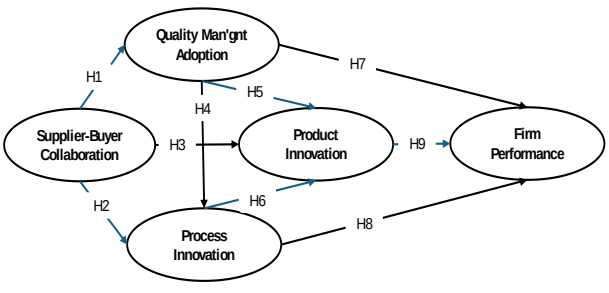

Figure 1. Research model

3. Methods

The research approach is causal, with one variable influencing another. The researcher conducted quantitative data analysis using descriptive and indirect methods (Sugiyono, 2020). This quantitative research uses statistical methods to analyze previously collected survey data, aiming to draw conclusions that can ultimately benefit the broader community. This study will test the influence of supplier-buyer collaboration on company performance through quality management adoption, process, and product innovation. The research population consisted of companies in the medium (20-100 employees) and large (>100 employees) categories. Data collection was conducted among East Java manufacturing companies using a purposive sampling approach. The research found that, for medium- and large-sized companies, respondents are permanent employees who have worked for at least 1 year. A total of 104 questionnaires were obtained, completed by manufacturing practitioners. The designated manufacturing company has selected a good set of suppliers, has strong relationships, and has engaged in collaborative activities.

The researcher has assigned the measurement items in the study according to the variables used. Supplier-buyer collaboration is a partnership between the company and its supplier to achieve set goals and increase competitiveness. Measurement items are set to measure supplier buyer collaboration by adopting research Tarigan and Siagian (2021) and Tarigan et al. (2020) are supplier buyers sharing in producing solutions (SBC1), supplier buyers sharing complementary ideas (SBC2), supplier buyers sharing risks (SBC3), supplier buyers communicating well (SBC4), and supplier buyers coordinating well (SBC5). The variable for quality management adoption is the application of quality systems and standards to ensure that products or services meet customer-set requirements. Measurement items used for quality management adoption by adopting research Wijaya et al. (2023) and Hudnurkar et al. (2022), namely the business process between functions has run adequately (QMA1), the process of producing requirements that meet the requirements (QMA2), and the department has run to produce quality product goals (QMA3). Each function is responsible for quality (QMA4).

The innovation process variable is a structured series process for generating ideas and creating value within a manufacturing company. The innovation process as the third variable is determined with four measurement items by adopting research Tarigan (2018) and Hartati et al. (2024) namely processes that have clear standards (IP1), the use of new technologies in the production process (IP2), more adequate production processes (IP3) and the stability of the production process running well (IP4). Product innovation, as the fifth variable in the research, is defined as new product development that provides added value to consumers. The measurement item used is the decrease in processing time in producing new products (PI1) (Vilkas et al., 2022), the variety of products produced is increasing (PI2) (Tarigan, 2018), the products produced have standard quality that meets the requirements (PI3) (Vilkas et al., 2022; Tarigan, 2018), and new products are produced based on well-organized market demand (PI4) (Vilkas et al., 2022; Tarigan, 2018). Company performance, as the last variable, is the company's ability to achieve goals set at periodic intervals. The research indicators set to measure the performance of the company by adopting the research of Siagian et al. (2020), Novitasari & Tarigan (2022) and Wijaya et al. (2023) are the increased sales growth rate (FP1), the company's operating costs have decreased effectively (FP2), the company has good customer satisfaction (FP3), the company can meet customer demand (FP4), and the delivery of finished products to customers on time (FP5).

The questionnaire used to collect respondents' answers uses the Likert Scale. Each respondent was asked to give a score on a scale of 1 to 5 for each of the questions given, where the number 1 means "strongly disagree", the number 2 means "disagree", the number 3 means "neutral", the number 4 means "agree", and the number 5 means "strongly agree". Data analysis was performed using the SEM-PLS version 4 software. Data analysis is carried out using the outer and inner goodness-of-fit models. The indicators for the outer model are set to have a minimum convergent validity value of 0.5, discriminant validity at least has a value of 0.5, composite reliability at least has a value of 0.7, Average Variance Extracted (AVE) has a minimum value of 0.5, and Cronbach's Alpha has a minimum value of 0.7. If these conditions are met, the variables tested are suitable. The determination of the hypothesis that is built is accepted or rejected by analysis of the path coefficient with a t-value greater than 1.96 and a P-value that is smaller than 0.05; it can be said that the hypothesis is built with a significant relationship, while the opposite can be said to be that there is no significant relationship.

4. Result

The researcher administered a questionnaire directly and used Google Forms to collect data from manufacturing companies in East Java, with the respondent profiles shown in Table 1.

Table 1. Profile respondent

Variable	Description	Sum	%
Number of questionnaires	Total questionnaires received	110	
	Incomplete questionnaire	7	6.36
	Further processing questionnaire	103	93.64
Gender	Man	62	60.19
	Woman	41	39.81
Long working time	2 - < 3 years	23	22.33
	3 - < 5 years	6	5.83
	5 - < 7 years	5	4.85
	Over 7 years	69	66.99
Managerial Position	Top management	9	8.74
	Middle management	71	68.93
	Lower management	23	22.33
Functional Department in the company	General	6	5.83
	Accounting/Finance	8	7.77
	Marketing/Sales	21	20.34
	Purchasing/Procurement	8	7.77
	Production/Planning/Warehouse	43	41.75
	IT Department	5	4.85
	QA/QC/R &D	4	3.88
	HRD	3	2.91
	Engineering	5	4.85

Based on Table 1, the majority of respondents were male (62, 60.19%), and many came from the company's operational part, which is directly related to supply chain management. Respondents with more than 7 years of work experience accounted for 69 people (66.99%). Respondents with long experience working in the company have operational skills in cooperative relationships with external partners and are familiar with many processes and product innovations implemented. The respondent profile, based on managerial position, is at the middle management level, with 71 people (68.93%) directly involved in the company's operations. Middle management is the person responsible for carrying out this role. The respondent's profile shows that the production or planning section or the warehouse has the most significant number of respondents, with 43 people (41.75%) completing the questionnaire. The next stage is to test the goodness of fit of the outer model shown in Table 2.

Based on Table 2, the lowest loading factor for the variable supplier-buyer collaboration is 0.779

Table 2. Goodness of fit outer research model

Research Items	Loading Factor	Cronbach Alpha	Composite Reliability	AVE
Supplier buyer collaboration (SBC)		0.909	0.933	0.736
Supplier buyer shares in producing solutions (SBC1)	0.901			
Supplier buyers share complementary ideas (SBC2)	0.876			
Supplier buyer sharing risk (SBC3)	0.906			
Supplier buyer communicates well (SBC4)	0.779			
Supplier buyers coordinate well (SBC5).	0.819			
Quality management adoption		0.857	0.903	0.701
Business process between functions has run adequately (QMA1)	0.862			
Process of generating meet the requirements (QMA2)	0.828			
The department has been working to produce quality product objectives (QMA3)	0.807			
Each function is responsible for quality (QMA4)	0.849			
Innovation process		0.880	0.918	0.738
Processes that have clear standards (IP1)	0.886			
Utilization of new technologies in the production process (IP2)	0.913			
More adequate production process (IP3)	0.839			
Stability of the production process runs well (IP4)	0.792			
Product innovation		0.852	0.900	0.695
The time it takes for a company to create a new product is fast (PI1)	0.741			
Continuous innovation by the company from new products issued (PI2).	0.903			
Intensive product quality improvement (PI3)	0.874			
Accelerate the development of new products to meet market needs (PI4).	0.807			
Firm Performance		0.898	0.925	0.711
Increased sales growth rate (FP1)	0.835			
The company's operating expenses decreased effectively (FP2)	0.788			
The company has good customer satisfaction (FP3)	0.907			
The company can meet customer demand (FP4)	0.889			
Delivery of finished products to customers according to the agreed time (FP5)	0.789			

(>0.500), namely Supplier buyer communicates well (SBC4), indicating that all measurement items in the variable are valid. The variable supplier-buyer collaboration had an AVE of 0.736 (>0.500), indicating it is valid. The reliability test for the variable supplier-buyer collaboration yielded a Cronbach's alpha of 0.909 and a composite reliability of 0.933, indicating it was reliable because it exceeded 0.700. The quality management adoption variable with the lowest measurement item in the department has been running to produce a quality product goal (QMA3) of 0.807 (>0.500) so that all measurement items in the variable can be declared valid.

The quality management adoption AVE (0.701) is >0.500, indicating it is valid. The reliability test for variable quality management adoption yielded a Cronbach's alpha of 0.857 and a composite reliability of 0.903, indicating it was reliable because both exceeded 0.700. The innovation process variable with the lowest measurement item, stability of the production process (IP4), is at 0.792 (>0.500), indicating that all measurement items are valid. The innovation process yielded an AVE of 0.738 (>0.500), indicating it is valid. The reliability test in the variable innovation process yielded a Cronbach's alpha of 0.880 and a composite reliability of 0.918, indicating reliability because both exceeded 0.700. Product innovation, with the lowest measurement item, the time it takes the company to create a new product, is (PI1) at 0.741 (>0.500), indicating that all measurement items are valid. Product innovation obtained an AVE of 0.695 (>0.500), so it is valid.

The reliability test for variable product innovation yielded a Cronbach's alpha of 0.852 and a composite reliability of 0.900, indicating it was reliable because both exceeded 0.700. Finally, the variable firm performance with the lowest measurement item in the company's operating costs has decreased effectively (FP2) by 0.788 (>0.500), indicating that all measurement items are valid. Firm performance obtained an AVE of 0.711 (>0.500), so it is valid. The reliability test for firm performance yielded a Cronbach's alpha of 0.898 and a composite reliability of 0.925, indicating reliability because both exceeded 0.700. Testing for the goodness-of-fit of the outer model has been conducted and meets the requirements.

The next stage is to test the hypothesis shown in Figure 2 and Table 3.

Table 3. Hypothesis testing for direct influence

Direct Path Coefficients	Path Coefficient	T Statistics	Remark
SBC -> QMA (H1)	0.858	24.81**	Supported
SBC -> IP (H2)	0.284	2.24**	Supported
SBC -> PI (H3)	0.139	1.45	Not Supported
QMA -> IP (H4)	0.572	4.27**	Supported
QMA -> PI (H5)	0.252	1.85*	Supported
IP -> PI (H6)	0.345	2.48**	Supported
QMA -> FP (H7)	0.466	4.30**	Supported
IP -> FP (H8)	0.200	1.66*	Supported
PI -> FP (H9)	0.172	1.65*	Supported

Note: ** supported at a Significant level of 5% (t-value > 1.96), * supported at a significant level of 10% (t-value > 1,64)

Figure 2 and Table 3 present the analysis results, in which all hypotheses are supported except H3. This study set a minimum significant level of 10% which implies the value exceeds the t-value of 1.64.

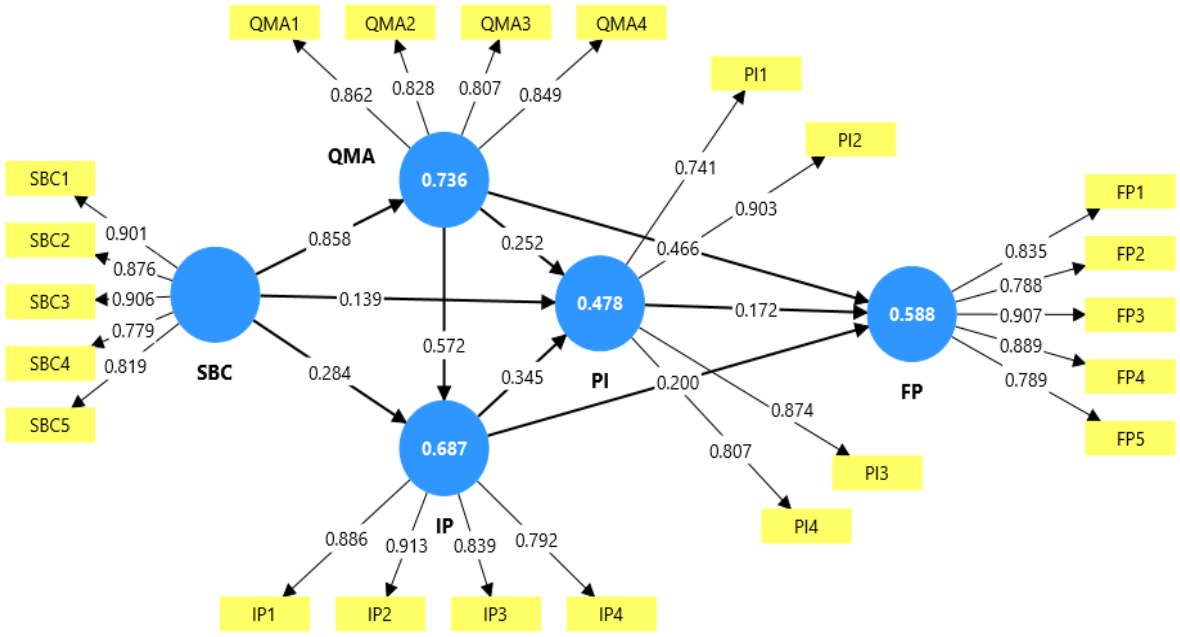

Figure 2. Results of hypotheses testing

5. Discussions

Based on Table 2, it is obtained for the first hypothesis (H1) that supplier buyer collaboration (SBR) affects quality management adoption of 0.858 and t-statistics of 24.81 (>1.96) or p-value of 0.000 (<0.05). This result shows that the first hypothesis is acceptable, indicating that the supplier-buyer collaboration, as described by the supplier-buyer share in producing solutions, can improve quality management adoption by establishing a production process that meets standard requirements. The results of the study confirm that supplier-buyer collaboration (SBC) affects the adoption of quality management (Fan & Stevenson, 2018; Da Silva et al., 2024; Seyedghorban et al., 2020; Agarwal, 2020; Asante & Ngulube, 2020). Supplier buyer collaboration (SBC) had an effect of 0.284 on process innovation, as the second hypothesis (H2) yielded a t-statistic of 2.24 (>1.96). These results show that supplier-buyer collaboration, driven by supplier-buyer item-sharing and complementary ideas, can improve the innovation process by establishing a stable production process.

The results of the study support the results of previous research, which stated that supplier-buyer collaboration affects the innovation process (Basana et al., 2023; Hoque & Maalouf, 2022; Patrucco et al., 2019). The third hypothesis (H3) of supplier buyer collaboration (SBR) has an effect of 0.139 on product innovation, obtained a t-statistic value of 1.45 (<1.96) or a p-value of 0.116 (>0.05). These results show that supplier-buyer collaboration does not have an impact on the product innovation of manufacturing companies.

Fourth hypothesis (H4): Quality management adoption had an effect of 0.572 on the innovation process, with a T-statistic of 4.27 (>1.96) and a P-value of 0.000 (<0.05). These results show that the quality management adoption, determined by the business item of the process between functions, has been implemented effectively and can improve the innovation process while maintaining the stability of the production process. The results of the study support those of the previous study, which found that Quality management adoption affects the innovation process (Chen et al., 2022; Lepistö et al., 2022). The fifth hypothesis (H5), that quality management adoption has an effect of 0.252 on product innovation, yielded a t-statistic of 1.85 (>1.65) and a p-value of 0.072 (<0.10), with a significance level of 10%. The results of the study show that adopting quality management with each function responsible for quality can increase product innovation by intensifying product quality. The results of the study support previous research indicating that Quality management adoption affects product innovation (Chen et al., 2022; Ershadi et al., 2019; Soares et al., 2017; Lepistö et al., 2022; Saleh et al., 2024).

The sixth hypothesis (H6) in the study determined that the innovation process affected product innovation by 0.345, with a t-statistic of 2.48 (>1.96) and a p-value of 0.015 (<0.05). The results of innovation process research using new technology in the production process can impact product innovation, leading to sustainable company-wide innovation in producing new products. The study's results support previous research, which found that the innovation process affects product innovation (Abdelaziz et al., 2023; Santos et al., 2023; Patrucco et al., 2019; Severo et al., 2020; Piñera-Salmerón et al., 2023). The seventh hypothesis (H7), which posits that quality management adoption affects firm performance, yields a coefficient of 0.466, a t-statistic of 4.30 (>1.96), and a p-value of 0.000 (<0.05). The results of quality management adoption research show that the process of producing requirements that meet customer demands can increase firm performance in companies with high customer satisfaction and that adequately meet customer demands. The results of the study support the results of previous research, which stated that quality management adoption affects the firm performance of the manufacturing industry in East Java (Ahinful et al., 2023; Chen et al., 2022; Ershadi et al., 2019; Soares et al., 2017; Kaur et al., 2020; Saleh et al., 2024).

The eighth hypothesis (H8) stated that the innovation process affects firm performance by 0.200, with a t-statistic of 1.66 (>1.65) and a p-value of 0.086 (<0.1). The results of innovation process research on accelerating the development of new products aligned with market needs can increase firm performance by boosting sales growth and effectively reducing operational costs. The results of the study support previous research that found the innovation process affects the performance of manufacturing firms in the East Java industry (Abdelaziz et al., 2023; Novijanti et al., 2023; Reyes-Gomez et al., 2024; Tarigan, 2018; Ameyibor et al., 2022). The ninth hypothesis (H9) stated that product innovation affects firm performance by 0.172, with a t-statistic of 1.65 (≥1.65) and a p-value of 0.086 (<0.1). The results of product innovation research on the time it takes for companies to develop new products quickly, and the extent to which product quality improvement intensively improves firm performance. The results of previous research support the conclusion that product innovation affects the performance of manufacturing firms in the East Java industry (Vilkas et al., 2022; Basana et al., 2024; Matekenya & Moyo, 2022; Ko et al., 2020).

Manufacturing companies in East Java have built strong relationships with suppliers to maintain stable raw material availability. The supplier-buyer collaboration

formed can produce high-quality, timely raw material suppliers, thereby supporting an adequately running production process. The process is running well, so there are many ideas and ways to improve it to produce products faster and of adequate quality. The company's ability to implement quality management must result in processes and products that meet the set requirements. Product and process innovations that are adequately implemented can increase the company's performance by producing products that meet customer needs and provide high satisfaction. Practical contribution of research in order to provide insight for company management to be able to build strong relationships with suppliers in producing product and process innovations in improving company performance. Management can adopt ISO (International Organization for Standardization) as a practical approach to quality management. The theoretical contribution of the research can enrich the theory of total quality management, which, when integrated with supply chain management, produces a resource-based view.

5. Conclusions

Suppliers in companies play an important role in ensuring the availability of high-quality raw materials, competitive prices, and timely delivery for the manufacturing industry. Companies need to ensure that suppliers can meet customer needs. Supplier-buyer collaboration is a forum for companies to build competitive advantage in the supply chain by ensuring that quality management is well implemented and effective. Supplier buyer collaboration that is built adequately has an impact on the innovation process by forming a stable production process that runs well, and does not have a direct effect on product innovation. Quality management is already adopted in companies, with business processes across functions running smoothly, and each function is responsible for quality to improve process and product innovation. The manufacturing industry's ability to develop innovative processes using new technologies can drive product innovation, enabling the production of new products regularly. Manufacturing companies strive to improve performance by achieving high customer satisfaction, meeting customer demands, increasing sales growth rates, reducing operating costs, and improving product quality. The company's performance is generated and influenced by the adoption of quality management, the innovation process, and product innovation. The company's top management can build a system that runs smoothly and ensures that all functions can carry out their respective roles effectively, thereby improving company performance.

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