
The Influence of Total Quality Management, Product Innovation and Process Innovation on the Performance of Recycling-Based SMEs in Sleman Regency

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Received: 08.01.2024

Reviewed: 17.01.2024

Accepted: 26.01.2024

Abstract

TQM has been proposed as a global advanced strategy to achieve quality goods and services that result in superior operational performance of SMEs. This study aims at the effect of TQM on product innovation, process innovation, and operational performance of SMEs and examines the effect of product innovation and process innovation on SME performance. Tests were also conducted to examine the influence of product innovation mediation variables and innovation processes on the relationship between TQM and SME operational performance. The study approach was carried out by collecting data through questionnaires through surveys. The respondents in this research were recycling-based SMEs in Sleman Regency, totaling 80 SMEs. The data analysis technique uses Partial Least Square (PLS). The results of this study indicate that TQM has a positive and significant effect on product innovation, process innovation, and operational performance of SMEs and product innovation and process innovation also has a positive and significant effect on SME performance. In addition, product innovation and process innovation positively and significantly mediate the relationship between TQM and SME operations. The results of this study have a theoretical contribution for future researchers and a practical contribution for business people, especially SMEs in order to continue to improve their operational performance

Keywords: Innovation, Performance, Total Quality Management, SME

1. Introduction

According to data from the Central Statistics Agency (BPS) as of September 2021, the contribution of SMEs to Indonesia's GDP reached 61.8%. However, SMEs often face various challenges in achieving optimal performance. One of the main challenges is the lack of access to the necessary resources and technology. In Sleman Regency, there are around 350 recycling-based SMEs that have the potential to grow and develop. However, many SMEs still face obstacles in achieving optimal performance, such as product quality problems, ineffective production management, and lack of access to markets.

Based on existing practical phenomena, SMEs play an important role in creating job opportunities, launching innovation processes, supporting entrepreneurial activities, and helping introduce new business models. However, these types of companies are subject to enormous competitive pressures, as the environments and markets in which they operate, as well as local and global economies, are very aggressive. Thus, it is important to re-analyze the operational performance of SMEs in the context of innovation to be able to bounce back in the post-pandemic era. SME operational performance is generally assessed into a set of several dimensions that describe the organization's internal operations in terms of product elements,

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process quality, efficiency and productivity. In some concepts, operational performance is calculated through productivity, effectiveness and efficiency of internal operations (Minna, 2014). Innovative organizations will be more productive in meeting customer demands and developing new talent, resulting in improved operational performance and more revenue. Innovation is critical to improving operational performance and efficiency. As a result, researchers are increasingly interested in the influence of various innovation characteristics on the operational performance of SMEs (Anifowose et al., 2022).

Several perspectives are used to differentiate between different types of innovation. Innovation is differentiated according to the field in which it is implemented, such as product innovation (goods/services) and process innovation (Antunes et al., 2021). Product innovation is the introduction of goods or services that are new or have significantly proven characteristics or uses. Meanwhile, process innovation is usually carried out with the aim of cutting production or transportation unit costs, to increase quality, or to produce or deliver a product (Suwignjo et al., 2022).

Innovation allows SMEs to adapt quickly to emerging changes in the environment and helps find new products and markets, in the face of an unstable environment. However, the question that arises in this approach is that SMEs cannot successfully follow an innovation strategy if they are not concerned with providing products and/or services that meet acceptable and demanding quality standards, taking into account the expectations and needs of potential customers. Therefore, the application of Total Quality Management (TQM) plays a key role, as it can be the starting point for the definition of an innovation strategy (Antunes et al., 2021). TQM has been highlighted as a tool that can help businesses in various sectors cope with rapid market transformation. Escrig-Tena (2004) recognized TQM as an advanced global strategy for achieving quality goods and services that result in operational performance excellence. Recently, TQM implementation seems to have a major impact on business effectiveness (Kanapathy et al., 2017).

Theoretically, this research is important to carry out. Research on the operational performance of SMEs has been studied by several previous researchers. On the other hand, the differences obtained by previous research still need to be reviewed. Based on a search for scientific articles carried out by researchers García-Fernandez et al. (2022), shows that most studies show a positive relationship between TQM and innovation, such as research carried out by Antunes et al. (2021) and Anifowose et al. (2022). Among them, there is a large number of other studies linking TQM to process and product innovation (García-Fernandez et al., 2022). Several studies show that there is no relationship between TQM and innovation (Yusr et al., 2017) or even this relationship is negative.

On the other hand, Bayraktar et al. (2009) emphasized that operational performance cannot be measured using a single indicator. In this context, researchers have measured operational performance differently in the literature. For example, Flynn et al. (2010) measure operational performance using indicators of flexibility, delivery, lead time, customer service level, and rapid introduction of new products to the market. Kebede Adem and Virdi (2020) use cost, quality, productivity, flexibility and delivery to measure operational performance, while Jabbour et al. (2013) operationalized operational performance using cost, quality, delivery, flexibility, new product development, and time to market. Trattner et al. (2019) used cost, time, quality, and delivery reliability to measure operational performance. However, the operational performance standards that are most needed are cost, flexibility, quality, delivery, lead time and time to market (Abdallah and Al-Ghwayeen, 2019; Nabass and Abdallah, 2019).

There are several reasons why this research is worth doing. First, the Special Region of Yogyakarta has enormous potential for innovative products. SMEs in Sleman Regency have been affected by COVID-19, therefore it is important to revive the SME economy in Sleman Regency. Second, the research model for SME operational performance related to TQM and innovation must be reviewed considering that conflicting results have been found in several previous researchers.

2. Literature Review

2.1. Innovation

The Organization for Economic Cooperation and Development (OECD) (2018) divides innovation novelty into three levels: global, institutional, and intermediate. At the global level, innovation is the first change to be implemented. Institutional level innovation means that the innovation in question has just been implemented in one institution but has previously been implemented in another institution. The OECD defines innovation as follows:

- Innovation is the implementation of (i) new products (goods or services); (ii) new processes; (iii) new marketing methods; (iv) new organizational methods; significant improvements in business operations, workplace institutions, or networks outside the institution.
- A sign of innovation is that it actually has to be implemented; new or improved implementations are implemented as they are promoted in the market; new procedures, ways of marketing, or ways of running an organization when they are actually used in a company's activities.

From the two points above, the definition of innovation relates to products and processes and two ways: organization and marketing. Product and process innovations must be new or maximally improved, meanwhile both methods (marketing and organization) need to be updated. Apart from being new or increasing very significantly, a product must be promoted to the market. New processes or ways must be implemented in certain company operations. Innovation occurs when both conditions are met. Another definition describes innovation as an organization's multi-stage process of turning ideas into new products or services and improving processes that can compete in appropriate markets. One of the more straightforward principles of innovation is explained as the successful exploitation of new ideas (Suwignjo et al., 2022). Merriam-Webster (2021) defines innovation in a modern way as follows: new ideas, creative thinking, or new imagination in the form of devices or methods. Innovation in this case is the application of better solutions to meet new needs or market requirements.

2.1.1. Product Innovation

Product innovation refers to advertising new or improved goods or services to the maximum regarding their properties or benefits. This includes maximum improvement in technical details, materials and materials, incorporated instruments, consumer friendliness or other functional characteristics (Mortensen & Bloch, 2005). Product innovation refers to "new products/services introduced to meet the needs of users or external markets" (Damanpour, 1991). In companies, innovative new product activities are called arms battles and are called a way to compete and strengthen. Product innovation is needed because of shortening product life processes, rapid changes in customer priorities, technological growth, other aspects of the market (Talay et al., 2014) and increasing competition (Cooper, 2000). The main hope for

product innovation is to implement superior customer numbers, gain competitive advantage and require long-term progress based on expanding and profitable new products and services (Rainey, 2008).

2.1.2. Process Innovation

Edquist (2001) proposed the application of organizational and technological aspects in process innovation. Meanwhile, the OECD (2018) has updated it with the term technological process innovation (TPI) to indicate a more precise distinction from organizational process innovation. TPI adopts new or expanded technological production methods to the greatest extent possible, including product delivery methods. These methods may involve changes in equipment or production organization or a combination of these changes and may be derived from new knowledge. Methods may be intended to produce or deliver new or technologically improved products, which cannot be produced or delivered using conventional production methods, or primarily to improve the efficiency of production or delivery of existing products. This information relates to organizational and operating methods, quality control, and other manufacturing procedures (Suwignjo et al., 2022).

2.2. Total Quality Management (TQM)

TQM is a vision obtained by a company based on long-term preparation, by forming and implementing an annual quality schedule that slowly leads the company to expand the vision, namely to the point where the following meanings of TQM become real: Company culture which is seen by developing customer satisfaction through improvement continuously, all employees in the company contribute actively (Anifowose et al., 2022). TQM is not an insignificant vision. At a time when most domestic and overseas markets are characterized by 'cutthroat competition', more and more companies are realizing that TQM is necessary simply to survive. Today, consumers can choose among a large number of competing products – and they do. Consumers choose products that provide the 'highest value for money', that is, products and services that provide the highest level of customer satisfaction in relation to price (Dahlgaard et al., 2008).

2.3. SME Operational Performance

SME operational performance is usually assessed as a set of dimensions that describe operations within the institution in terms of product elements, process pros and cons, efficiency and production capacity. In a number of studies, operational performance is obtained through effectiveness, productivity and efficiency of internal activities (Minna, 2014). In general, this is a management concept that aims to make quality less of an operational problem and more of a concern for all units, departments and divisions of the company that will be responsible for operational performance (Anifowose et al., 2022).

2.4. Hypotheses

This research refers to research that has been conducted by several previous researchers. By combining several models and hypotheses in previous research, the conceptual model proposed in this research is shown in Figure 1.

Based on the conceptual framework seen in Figure 1, the hypotheses in this research are as follows:

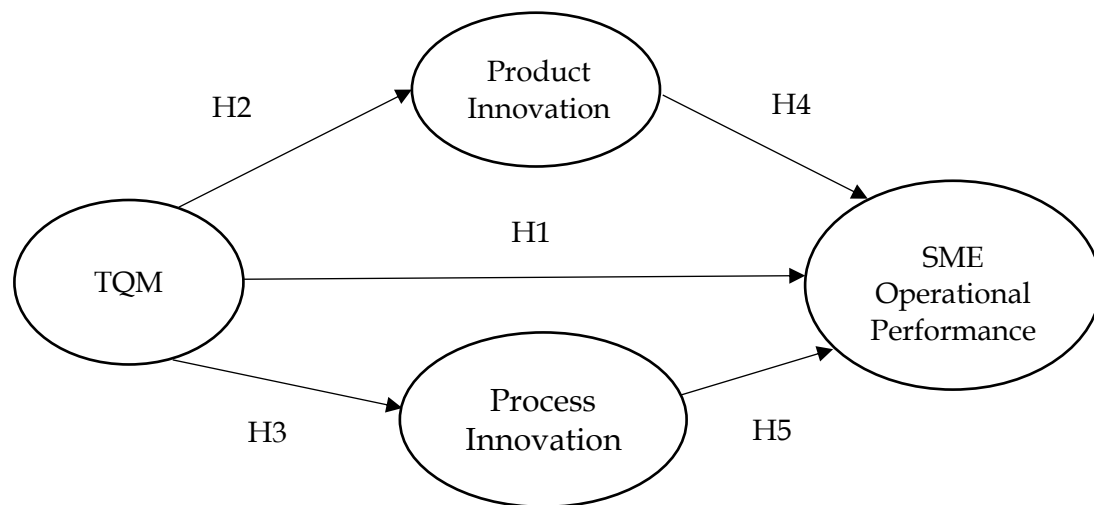


Figure 1. Theoretical Framework

- H1.** TQM has a direct effect on SME operational performance
- H2.** TQM has a direct effect on Product Innovation
- H3.** TQM has a direct effect on Process Innovation
- H4.** Product innovation has a direct effect on SME operational performance
- H5.** Process Innovation has a direct effect on SME Operational Performance
- H6.** TQM has an indirect effect on SME Operational Performance with Product Innovation as a mediating variable

3. Methods

According to the research objectives, this research is research for hypothesis experiments. According to Sekaran and Bougie (2016), a hypothesis experiment is research that describes the relationship between dependent and independent variables, or other variables that impact one variable on another variable. However, based on time horizon, these studies are grouped together. This research was conducted using quantitative data. The survey approach is carried out by obtaining information by distributing forms or interviews so that later it can produce various aspects of the population (Fraenkel and Wallen, 1990). The population in this study were all recycling-based SMEs in Sleman, Yogyakarta Special Region, Indonesia. The total sample in this study was 80 SMEs as respondents.

In this research, data was obtained directly through questionnaires regarding TQM, product innovation, process innovation, and SME operational performance. Table 2 showed the measurement indicators for each variable that will be operated in this research.

4. Result and Discussion

The analysis technique obtained in this research is Partial Least Square (PLS). According to Hair et al. (2017), PLS is a Structural Equation Modeling (SEM) technique that is sufficient to

Table 2. Research Instruments

Variable	Definition	Indicator
TQM (X)	TQM is defined as an all-encompassing management technique and structure aimed at improving a company's operational capabilities and processes to develop and deliver products or services that meet customer needs or requirements by being cheaper, safer, and faster than competitors (Kaur et al., 2019).	1) Human Resources Management 2) Customer Focus 3) Strategy Planning 4) Process Management
Product Innovation (Z1)	Product innovation is defined as a way of introducing new product improvements or services and, in this way, customer ambitions can be easily shaped when a company has obtained an innovative and high-quality product (Antunes et al., 2021).	1) Different and innovative new products/services. 2) New and innovative technology. 3) Innovative products/services in the last two years. 4) Product/service innovation to increase market share and product quality.
Process Innovation (Z2)	Process innovation is defined as implementing and changing the way products are produced by trying to redesign or improve business processes to increase business efficiency and customer satisfaction, including new methods and ways of working in the process (Antunes et al., 2021).	1) Latest technological innovation in internal processes. 2) Modify the processes, techniques and technology. 3) Internal process innovation is seen to increase organizational efficiency. 4) Innovation is communicated clearly and objectively.
SME Operational Performance (Y)	SME operational performance is a set of dimensions that reflect the organization's internal operations which include products, process quality, efficiency and productivity (Anifowose et al., 2022).	1) SME customer satisfaction. 2) Developing the quality of SMEs. 3) SME cost management. 4) SME responsiveness. 5) SME productivity.

Table 3. Characteristics of SMEs

SMEs (1)	Number of SMEs (2)	Percentage (%) (3)
Length of business:		
1. 5-10 years	52	65
2. > 10 years	28	35
Number of SME employees:		
1. 20-50 people	72	90
2. > 50 people	8	10
Income per Year:		
1. 1 – 100 million (rupiah)	16	20
2. 101 – 500 million (rupiah)	57	71.25
3. 501 million – 1 billion (rupiah)	7	8.75

analyze latent variables, indicator variables and assessment errors directly. PLS can be applied with small sample sizes and can be used on all data scales. The form or test of reflective indicators is obtained through discriminant validity and AVE. The total sample in this study was 80 SMEs as respondents. Table 3 showed the characteristics of SMEs in this research.

In this research, an analysis of the validity and reliability of four main variables was carried out, namely TQM, product innovation, process innovation, and SME operational performance. This analysis aims to ensure that the variables used in the research have an adequate level of validity and reliability, so that the research results can be reliable and accurate.

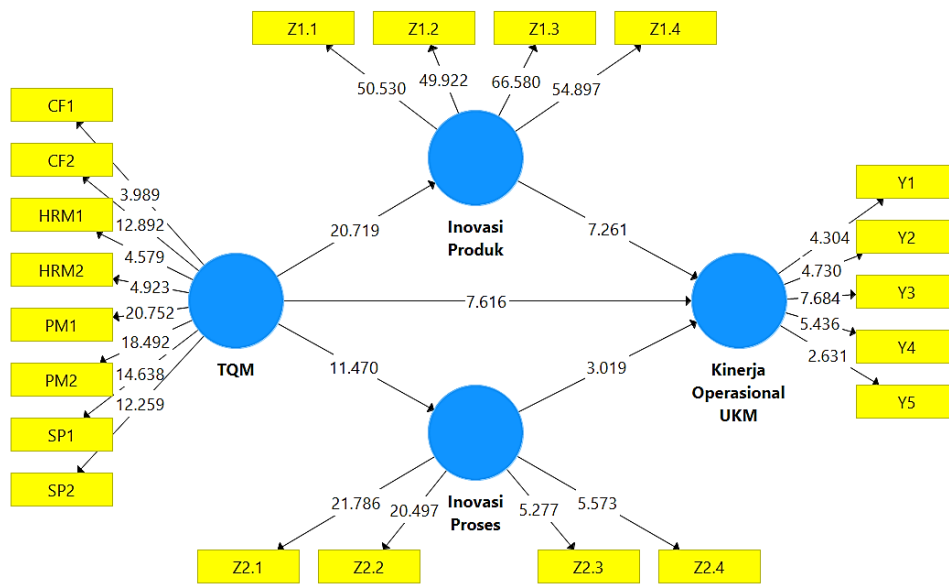


Figure 2. Outer Model Test Results

Table 4. Validity and Reliability Test

Variable	Indicator	Outer Loading	AVE	Composite Reliability	Cronbach Alpha
TQM (X)	CF1	0.792	0.573	0.914	0.900
	CF2	0.836			
	HRM1	0.733			
	HRM2	0.791			
	PM1	0.818			
	PM2	0.796			
	SP1	0.830			
	SP2	0.817			
Product Innovation (Z1)	Z1.1	0.931	0.872	0.965	0.951
	Z1.2	0.926			
	Z1.3	0.942			
	Z1.4	0.935			
Process Innovation (Z2)	Z2.1	0.930	0.615	0.859	0.771
	Z2.2	0.916			
	Z2.3	0.703			
	Z2.4	0.712			
SME Operational Performance (Y)	Y1	0.742	0.521	0.777	0.780
	Y2	0.749			
	Y3	0.704			
	Y4	0.732			
	Y5	0.751			

Table 5. Direct Effect Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Information
TQM → Product Innovation → SME Operational Performance	0.200	0.205	0.164	3.224	0.001	Accepted
TQM → Process Innovation → SME Operational Performance	0.109	0.109	0.093	11.171	0.002	Accepted

Adj R²: 0.682

Q²: 0.965

** Sig < 5%

Based on Figure 2, it can be explained that the largest path coefficient value is shown by the influence of TQM on product innovation with a value of 20,719. Meanwhile, the smallest path coefficient value is shown by the influence of process innovation on SME operational performance of 3,019.

Based on the test results of 30 respondents shown in Table 4, it is known that the AVE value for each variable has a value > 0.5 and the composite reliability value for each variable has a value > 0.6. This means that each variable can be declared valid and reliable, so that it can be used for further analytical research.

Based on direct test results by looking at the path coefficients values, the results of this research state that TQM has a positive and significant effect on SME operational performance, product innovation and process innovation. This research is in line with the results of research conducted by Danyen & Callychurn (2015), Olaleye et al. (2021), and Anifowose et al. (2022) which has shown that a TQM system can improve the operational performance of small and medium businesses. Akgun et al. (2013) report that using TQM helps companies increase long-term profits of SMEs. Total quality management can bring economic benefits to recycling SMEs in Sleman Regency. When TQM is truly implemented with full commitment. This is in line with the resource-based principles of complementary resources, implying that work should be directed at developing total quality management performance. Thus, the human resource management system in SMEs needs to be directed clearly and objectively so that the process of developing total quality management performance will continue to improve.

Long et al. (2015), Bouranta et al. (2019), and Anifowose et al. (2022) state that SMEs that adopt TQM can achieve continuous quality improvement in various dimensions of the company, with the aim of offering better products and services, thereby meeting customer needs. This finding is also in line with the results of research conducted by Miranda Silva et al. (2014), Bouranta et al. (2019), and Anifowose et al. (2022) which proves that innovation management is considered a multidimensional approach that includes vision, leadership, culture, knowledge, people, technology and the organizational structure itself. Recycling SMEs in Sleman Regency must be open to smart and creative ideas, and must design mechanisms that start with supporting human resources. Hi this is a key point that makes it

Table 6. Indirect Effect Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Information
TQM → Product Innovation → SME Operational Performance	0.200	0.205	0.164	3.224	0.001	Accepted
TQM → Process Innovation → SME Operational Performance	0.109	0.109	0.093	11.171	0.002	Accepted

** Sig < 5%

possible to consider the close relationship between TQM and its dimensions in process innovation.

Based on direct test results by looking at the path coefficient values, the results of this research state that product innovation and process innovation have a positive and significant effect on the operational performance of SMEs. This research is in line with the results of research conducted by Muñoz-Pascual et al. (2019), Carvajal (2021) and Anifowose et al. (2022) which states that product innovation is the result of successfully exploiting new knowledge and sustainability. This process consists of technical design, research and development, manufacturing, management, and commercial activities that constitute the marketing of new (or improved) products. The innovation process includes several stages from discovery to implementation that make success dependent on the company's efforts. This process plays an important role in the success of innovation. Recycling SMEs in Sleman Regency can achieve operational performance through innovation if they maintain the SME new product innovation development process. This finding is in line with the results of research that has been implemented by Zhang (2022) and Anifowose et al. (2022) who have stated that the influence of process innovation on SMEs will create a strong foundation for SMEs to revive their innovative activities. Innovative SMEs will be more productive in meeting customer demands and developing new talent, resulting in improved performance and more revenue.

Based on an indirect test by looking at the specific indirect effect value, the results of this research show that TQM has a positive and significant effect on the operational performance of SMEs which is mediated by product innovation and process innovation. The results of this research are in line with research implemented by García-Fernandez et al. (2022) and Anifowose et al. (2022) who found that resource-based principles should be directed at developing total quality management performance, by increasing new product innovation. Explicit knowledge resources, which exist in TQM methods and procedures, determine total quality management performance, when recycling SMEs in Sleman Regency have adopted new technological innovations in creating new products.

5. Conclusion

Research that has been conducted shows that the operational performance of recycling-based SMEs in Sleman Regency is influenced by TQM, product innovation and process innovation.

Based on the results of the data analysis and discussion that have been described, the following conclusions can be drawn: TQM has a positive and significant effect on the operational performance of SMEs in recycling-based SMEs in Sleman Regency; TQM has a positive and significant effect on product innovation in recycling-based SMEs in Sleman Regency; TQM has a positive and significant effect on process innovation in recycling-based SMEs in Sleman Regency; product innovation has a positive and significant effect on the operational performance of SMEs in recycling-based SMEs in Sleman Regency; process innovation has a positive and significant effect on SME operational performance in recycling-based SMEs in Sleman Regency; TQM has a positive and significant effect on SME Operational Performance with Product Innovation as a mediating variable in recycling-based SMEs in Sleman Regency; and TQM has a positive and significant effect on SME Operational Performance with Process Innovation as a mediating variable in recycling-based SMEs in Sleman Regency.

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