

Design and Technical Quality on The Smes Efficiency: Empirical Evidence from Batik SMEs in Central Java, Indonesia

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Abstract

The research is aimed to analyze the effect of design and technical quality implementation on technical and economic efficiency in the batik SMEs (small medium enterprises) in the Central Java province, Indonesia. Implementation of the technical quality is measured by process management implementation. Implementation of the design quality is measured by access to the development of the batik designs quality. The data are collected by direct interview approach to 100 manager-owners of batik business. Efisiensi teknis dan ekonomi diestimasi melalui stochastic efficiency frontier analysis. Furthermore, analysis of the implementation of design and technical quality on technical and economic efficiency uses a regression analysis with dummy variables. Competitive strategy orientation was used as the control variable. The final results are: (1) the role of entrepreneurs in the implementation of design and technical quality does significantly on technical efficiency, (2) the entrepreneurs role in the implementation of design and technical quality does significantly increase economic efficiency. The application of quality management significantly increase economic efficiency primarily in companies with focus and differentiation strategy. Economic efficiency are higher in entrepreneurial implement design and technical quality, and using focused and differentiation strategy. The conclusion this study is the design and technical quality implementation has an effect on the batik SMEs revenue efficiency.

Keyword: stochastic efficiency frontier, SMEs, total quality management, design and technical quality

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1. Introduction

Business environment in fashion industry are in the age of more from less economy, digital-creative economy, and environment industry increasingly competitive and dynamic (Temouri et al., 2020). In the more from less economy age, businesses that survive and competitive in the market is that ability produce high-value products for customers with less resources (Bidwell, 2011). In the era of digital and creative economy, fashion product not only related to clothing, but

also sign, symbol and lifestyle (UNESCO, 2015). In an increasingly competitive and dynamic environment, product life cycles are getting shorter, market tastes are volatile, competition is increasing and uncertain (Majuri & Halonen, 2019).

One of the products in the SME sector fashion industry is batik. Batik as one commodity of cultural heritage of Indonesia has a potential to compete in the global market. In the more from less economy (Bidwell, 2011), it is important for

batik SMEs to produce unique products, of high value for customers, with the less resources. This can be done through, among others, quality management practices. Batik business to be competitive is not only through technical quality (quality materials, quality workforce, quality production processes) but also the practice of quality design, namely how products are designed according to market tastes and value created to customers. Quality management practices (quality planning and design, quality control, quality evaluation) are limited to SMEs because besides the limitations of economies of scale, they are also traditional management (Burlea-Schiopoiu & Mihai, 2019; Henttonen & Lehtimäki, 2017; O. Brien & Hamburg, 2014; Temouri et al., 2020; Ye & Kulathunga, 2019).

Integrated Quality Management, known as Total Quality Management (TQM) is a leading management philosophy that is used to improve the position and performance of the company (Ali & Yusuf, 2019; Anil & K.P., 2019; Deshpande, 2019; Essel, 2020; Hilman et al., 2020; Mushtaq & Peng, 2020; Sahoo & Yadav, 2017; Sinha et al., 2016). TQM is a tool of strategic, tactical and operational research in the field of quality management (Feizollahi et al., 2013; Kantardjieva, 2014; Ojo, 2013; Yunis et al., 2013). TQM approach is one of the most widely applied and well accepted approach to business excellence instead of Continuous Quality Improvement (CQI), Six Sigma, Just- in-Time (JIT), and Supply Chain Management (SCM). TQM implementation provides many benefits in supporting the competitiveness of enterprises (Ojo, 2013). However, the application of TQM must be tailored to the company's management strategy, enterprise characteristics and environmental characteristics because the process associated with the expenses, time and resources to several studies (Feizollahi et al., 2013) has not been consistently integrated with the effective implementation of TQM for small companies, companies with local market orientation, leadership-oriented strategy and the intensity of lower costs competition (Hilman et al., 2020; Sahoo & Yadav, 2017; Sinha et al., 2016).

In general, the empirical literature on TQM consists of two groups, soft TQM and hard TQM. TQM hard involves more many techniques stats like using statistical quality control for quality control, while TQM soft mainly related to the "people" and aspects of the behavior of TQM (Ali & Yusuf, 2019; Anil & K.P., 2019; Deshpande, 2019; Essel, 2020; Hilman et al., 2020; Mushtaq & Peng, 2020; Sahoo & Yadav, 2017; Sinha et al., 2016). The importance of technical and design quality in TQM soft literature is explained by several studies (Widrick et al., 2002; Zhu et al., 2007), but the influence of technical and design quality on performance has not been widely explained by several studies. One way to know how to evaluate the effectiveness of technical and design quality is to connect the design and production processes with production and market performance.

2. Literature Review

2.1 Design and Technical Quality

Quality management is one of the tools for improving performance (Al-Swidi & Mahmood, 2012; Anil & K.P., 2019). Awareness of quality has emerged since the industrialization age (1980s), starting from the separation of defective products that focus on the final product (inspection), followed by the statistical quality control (1920s). detect whether these deviations are caused by errors in production or just by chance, the quality assurance (1960s) and the strategic quality management (van Kemenade, 2014). The term Total Quality Management (TQM) was first introduced by Fegenbaum with the term "total quality" at an international conference in Tokyo in 1969. Ishikawa explained "company wide quality control" where all employees from top management to their employees must learn and participate in quality control (van Kemenade, 2014).

Quality management is not only related to technical quality control, but also involves systems that involve leadership practices, quality planning and strategy, customer focus, process management, human resource management and performance. Quality is not only related to the

final product (quality products or services), but also to quality inputs and processes (Al-Swidi & Mahmood, 2012; Gonzalez & Jiménez, 2013; Kantardjieva, 2014; Ojo, 2013). In the more form less economy, competitive products are those that use minimal resources (material, labor skills, capital), by creating maximum value for customers. In creative industry products such as fashion, the quality of fashion industry products is not only related to technical quality (material, labor skills, capital), but also value created.

Two elements of quality structure—design quality and Technical quality are recognized and described in the literature (Widrick et al., 2002). Design quality is defined as a fit between a product's (service's) design and customer needs (Widrick et al., 2002; Zhu et al., 2007). Technical quality is defined as a fit between the attributes of an actual product and its specification. Quality of technical as compliance with specifications reflects an operations, or internally oriented aspect of quality. Adherence to specifications stems from a high level of consistency and low variation in internal processes. Better technical quality is achieved when things are done right, i.e., when the efficiency is high. Quality of technical can be rather easily measured through statistical means such as process capability (the ratio between specification and control limits). Tools for improvement of technical quality are tools of statistical quality control such as control charts, scatter diagrams etc.

As a match between product features and customer expectations and needs, quality of design is a market, or externally oriented, aspect of quality. Design quality is high when the product is “right”, so it is oriented towards effectiveness rather than efficiency. Quality of design is determined by three factors (Widrick et al., 2002): deep understanding of customer requirements, translation of these requirements into a product and continuous improvement of the design process. Such an improvement is based on close cooperation among marketing, research and development, and engineering.

Since design quality represents a fit between product features and customer needs, it reflects not just internal attributes of a product itself but interaction between those attributes and external factors (Widrick et al., 2002). Design quality may change as a result of improvements in product features or incorporation of new features into existing products as well as the development of new products. It may alter also without any change in the product itself: when needs and expectations rise while product features remain the same, a misfit between the two factors is generated and quality of design declines. By the same token, if new, attractive features are developed, that does not necessarily mean that design quality grows. In the case that needs and expectations grow faster than does the level of product features, a gap between expectations and features also arises, and design quality decreases. Though the product itself has improved, it did not improve fast enough. In order to keep the same level of this dimension, features have to be enhanced at the same pace as customer needs grow.

Sometimes design quality is conceived of in a narrower fashion as “quality of design process”, oriented towards better manufacturability and reliability of a new product (Widrick et al., 2002; Zhu et al., 2007). In that case design quality is viewed as part of internal quality performance. Manufacturability orientation may be regarded as internal customer focus because production and adjacent functions are subsequent stages in the value chain following functions directly involved in the design process. In a more inclusive fashion, design quality can be seen as fit between product features and needs of both external and internal customers. For the reason that external customers are more pivotal for an organization than internal customers and requirements of internal customers are no more than derivative of the needs and expectations of external customers, quality of design is viewed here in mostly outward fashion.

2.2 Technical and Economic Efficiency

The firm's technology is represented by the stochastic frontier production function as follows (Chen et al., 2015):

$$Y_i = f(X_i; \beta) + e_i \quad (1)$$

where Y_i = the output of the i th SMEs, X_i = a vector of input quantities of the i th SMEs, and β = a vector of unknown parameters to be estimated. Consider the following:

$$e_i = (V_i - U_i) \quad (2)$$

The V_i are assumed to be independent and identically distributed random errors independent of the U_i . The U_i are nonnegative technical inefficiency effects representing management factors and are assumed to be independently distributed with mean u_i and variance σ_u^2 . The i th firm exploits the full technological production potential when the value of U_i comes out to be equal to zero, and the SMEs is then producing at the production frontier beyond which he cannot produce. The greater the magnitude of U_i from the production frontier, the higher the level of inefficiency of the entrepreneurs. The maximum likelihood estimation of (1) provides estimators for the beta coefficients. The variances of the random errors V_i and those of the technical and allocative inefficiency effects U_i and overall variance of the model σ_e^2 are related; thus,

$$\sigma_e^2 = \sigma_v^2 + \sigma_u^2 \quad (3)$$

The ratio $\gamma = \sigma_u^2 / \sigma_e^2$ measures the total variation of output from the frontier which can be attributed to technical or allocative inefficiency. Subtracting V_i from both sides of (1) yields

$$Y_{i*} = y_i - V_i = f(X_i; \beta) - U_i \quad (4)$$

where Y_{i*} is the observed output of the i th firm, adjusted for the stochastic noise captured by V_i . Equation (4) is the basis for deriving the technically efficient input vectors X_{ei} and for analytically

deriving the dual cost frontier of the production function represented by (1). For a given level of output Y_{i*} , the technically efficient input vector for the i th firm, X_{ei} , is derived by simultaneously solving (4) and the ratios $X_1/X_i = k_i (i > 1)$ where k_i is the ratio of observed inputs X_1 and X_i . Assuming that the production function in (1) is self-dual, the dual cost frontier can be derived algebraically and written in a general form as

$$C_i = f(P_i; \alpha, Y_{i*}; \alpha) \quad (5)$$

where C_i is the minimum cost of the i th firm associated with output Y_{i*} . P_i is a vector of input prices for the i th firm, and α is a vector of parameters. The economically efficient input vector for the i th firm, X_{ei} , is derived by applying Shephard's Lemma and substituting the firm's input prices and output level into the resulting system of input demand equations:

$$\partial C_i / \partial P_i = X_{ei} (P_i, Y_{i*}; \beta) \quad i = 1, 2, \dots, m \text{ inputs} \quad (6)$$

where β is a vector of estimated parameters. The observed, technically efficient, and economically efficient costs of production of the i th firm are equal to $P_i X_i$, $P_i X_{ei}$, and $P_i X_{ei}$, respectively. These cost measures are used to compute technical efficiency (TE) and economic efficiency (EE) indices for the i th firm as follows:

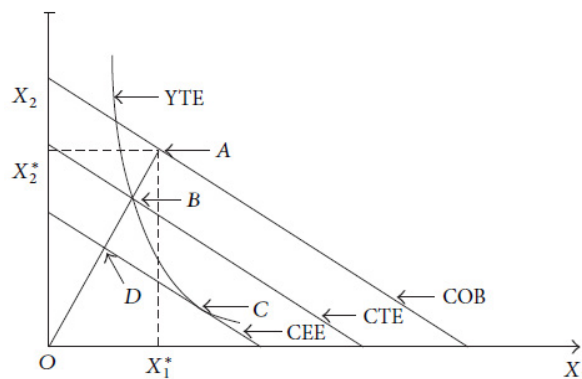
$$TE_i = \frac{P_i X_{ei}}{P_i X_i} \quad (7a)$$

$$EE_i = \frac{P_i X_{ei}}{P_i X_i} \quad (7b)$$

Following Farrell (1957), the allocative efficiency (AE) index can be derived from (7a) and (7b) as follows:

$$AE_i = \frac{P_i X_{ei}}{P_i X_{ti}} \quad (8)$$

Thus the total cost or economic efficiency of the i th firm (EE_i) can be decomposed into its technical (TE_i) and allocative (AE_i) components.



YTE: technically efficient isoquant
 CTE: technically efficient cost
 CEE: economically efficient cost
 COB: observed cost

Figure 1: Graphical Representation of observed and technically and economically efficient cost Measures. Technical efficiency (TE), allocative efficiency (AE), and economic efficiency (EE) are equal to the following: $TE = OB/OA = CTE /COB$, $AE = OD/OB = CEE/ CTE$, and $EE = TE * AE = OD/OA = CEE/COB$.

3. Materials and Methods

This research is to analyze the role of entrepreneurs in quality management by incorporating characteristic factors of business (2015). The research study will be discussing a strategy on the competitiveness of companies batik.

In this study, the population involves all Batik industries in Central Java Province including 538 enterprises; 55 large industries, 221 medium scale industries, and 262 small-scale industries (Ministry, 2014). The sampling was taken through stratified sampling (Multi Stage Sampling). Based on the above criteria, sampling region gained 3 data: 1) Pekalongan regency as batik industrial center with the greatest batik enterprises in Central Java; 2) Solo regency as a palace batik center with the secondary largest number of business batik units in Central Java, 3) Lasem District of Rembang as coastal batik centers with highest growth number of business units in Central Java.

The analysis method in this research occupies stochastic efficiency frontier analysis. The production function and revenue of batik industry can be illustrated in the following formulas derived from the function of Cob Douglas:

$$Q = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 + e \quad (9)$$

Where: Q = The total of batik production/Month (IDR), X_1 = The average of labour cost /Month (IDR), X_2 = The average of material cost and componental/Month (IDR), X_3 = The average of overhead cost/Month (IDR), a = intercept, slope, e = external factors of the model. The equation (9) in the natural algorithm function are illustrated as in the following:

$$\ln Q = a_0 + a_1 \ln X_1 + a_2 \ln X_2 + a_3 \ln X_3 + e \quad (10)$$

Technical efficiency ($ET = Q' - Q$), the efficiency that connects the actual production (Q) with the maximum production position (Q'). This ET shows the difference between maximum production and actual production. Economic efficiency ($EE = Y' - Y$), the efficiency that links the actual profit with the maximum profit. EE shows the difference between the maximum profit and the actual profit. Further, the role of entrepreneur toward technical efficiency and economic efficiency can be described in the following formula:

$$TE = \delta_0 + \delta_1 D_1 + \delta_2 D_2 + \delta_3 D_3 + \varepsilon_1 \quad (11)$$

$$EE = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \varepsilon_2 \quad (12)$$

Where: $Q' - Q$ = technical efficiency, $Y' - Y$ = economic efficiency, = Technical Quality Adoption (yes=1, no=0), = Design Quality Adoption (yes=1, no=0), = strategy type (0=cost leadership, 1= focus, differentiation), = constant, regression coefficient, = external factor of the model.

4. Results and Discussion

4.1 Batik SMEs Activities in Quality Management

The study found that the most Batik SMEs entrepreneurs obtain batik skills from informal experiences from generation to generation and only 24% of formal education. Traditional patterns represent 67% of batik production and the remaining 33% are contemporary patterns. Most batik entrepreneurs don't have their own design staff. Most batik patterns (67%) come from orders from market agents or buyers. Only 16% have design staff. Access for professional designers are only 12% which is generally a fashion design. Most people only have the task of drawing patterns. Most design activities are carried out by the owners themselves who have a background in design (24%). A source of new design information was obtained from the batik design community (24%). 33% of batik entrepreneurs only focus on production and do not focus on batik pattern design. Batik Craft is a creative product in the field of fashion art, so the quality of design is important. Batik products are hereditary cultural heritage products. Batik Patterns is a cultural heritage that represents aspects of locality, however batik designs also need to adjust to market trends and tastes. In addition to the design quality, the technical quality of batik cloth and coloring is an important aspect in batik marketing. Fabric quality consists of: comfortable level, durability, not easily damaged or torn. The color quality is that the color does not easily fade, the color is not blurred (color arises), clean or there is no medicinal flag, and is not wrong in color.

Batik businesses that are the object of research are medium-sized, small enterprises, so that most do not have formal mechanisms for quality management, such as: absence of formal planning on quality (64%), absence of formal

operational standard procedures (64%), no has a quality control officer (84%), does not have a staff or special unit that handles consumer complaints (88%). Only 16% of the sample SMEs have operating standards in several work units, namely there are written technical instructions that can be seen at any time by workers to remind how standard the operation of the unit is. Training on quality is conducted informally based on experience (100%) and limited to being done formally (26%).

Quality control is carried out starting from controlling material quality standards, quality standards of production processes, intermediate goods, finished goods, up to the standard delivery of final products to consumers, so that goods (services) are produced in accordance with the planned quality specifications. Quality assurance is carried out by replacing defective products with better quality products (100%). Handling defective products is done by selling defective products to container traders with the risk of decreasing selling prices.

Table 1. Batik SMEs Activities in Quality Management

Activities in Quality Management	Percent (%)
A. Design Quality	
1. degree of school design	24
2. have design staff	16
3. knowledge sharing community	24
4. access for professional designers	12
5. design form buyer or marketing agent	67
6. batik mark certification	37
7. others	33
B. Technical Quality	
1. control mechanism for raw materials	34
2. control coloring and drug composition	34
3. control of packing and delivery	100
4. has quality control staff	16
5. has standard operational procedure standards	16
6. Process and product quality certification	34

Activities in Quality Management	Percent (%)
7. environmentally friendly process certification	22
8. There are staff who handle consumer complaints	12
9. sale of defective products on the secondary market	100
10. informal training	100
11. formal training	26
12. access to knowledge and information from local government	63

Source : primary data

4.2 Production and Revenue of Batik Industries

Return to scale is a situation where output increases in response to the proportional increase of all inputs. Refers to Cobb-Douglas function, the coefficients of each independent variable is the elasticity of the elastic dependent. The analysis variable changes exogenous variables on endogenous variables of production volume and revenue batik SMEs using the natural logarithm regression models. The test results are presented in Table 1.

Table 2. Summary of Production and Revenue Elasticity

Parameter	Production Function		Revenue Function	
	β	ρ	β	ρ
Constant	-11,066	0,000	3,111	0,000
LnX_1	0,723	0,000	0,331	0,000
LnX_2	0,223	0,000	0,365	0,000
LnX_3	0,135	0,000	0,216	0,000
R^2	0,998		0,858	
F test	15518		200,275	
Sig. F (p-value)	0,000		0,000	

Source : primary data

In terms of production function, Table 1 explained that elasticity of labor costs (LnX_1) is 0.723. It means that any changes with labor costs by 1% will contribute changes to the production of batik at 0.723% if other variables are constant. Elasticity of variable costs of raw materials

(LnX_2) is 0.223. It means that any changes in raw material costs by 1% will contribute changes to the production of batik at 0.223% if other variables are constant. Elasticity variable fixed cost (LnX_3) is 0.135. It means that any increase in costs remained at 1% will contribute to the production of batik change of 0.35% if other variables are constant.

In terms of the revenue function, elasticity of labor costs (LnX_1) is 0.331. It means that any changes with labor costs by 1% will contribute changes to income (gross) from the sale of batik at 0.331% if other variables are constant. Elasticity of variable costs of raw materials (LnX_2) is 0,365. It means that any change in raw material costs by 1% will contribute changes to income (gross) of batik sales at 0.365% if other variables are constant. Elasticity variable fixed cost (LnX_3) is 0.216. It means that any increase in costs remained at 1% will contribute changes to income (gross) from the sale of batik at 0.216% if other variables are constant.

4.3 TQM Adoption and Batik Industries Efficiency

This stage (Table 2) is analysis of the role of entrepreneurs in the implementation of technical quality (D_1), design quality (D_2) and competitive strategy (D_3) treated with regression with point deviation in the production function and the effect on revenue. On the technical efficiency (Table 2), test results obtained by the correlation coefficient (R) positive (0.235). However the low correlation coefficient ($0.235 < 0.3$) indicates a weak relationship. The effect of entrepreneurs in the implementation of technical and design quality on technical efficiency can not be explained and tends to be negative. These results can be attributed to other factors such as the economies scale efficiency and costs for the quality management adoption. Testing simultaneous equations with the *goodness of fit* obtained F count (F -test) of 1.869 ($\rho = 0.140 > 0.5$). It shows that the model does not fit with the data. Thus, it cannot be analyzed further (Table 2).

The findings of this study is in line with the opinion of previous research (Talib et al., 2010; Ahmadi et al., 2012) that TQM is difficult to

apply in SMEs due to the relatively high cost of certification, implementation, and maintenance of the certificate. It shows that the government needs to provide facilities for the manufacturing process as well as the extension of the trademark certificate Batik Indonesia. By so doing, it will help the batik entrepreneurs to compete with foreign products. Problems in MSEs is due to the efficiency of economies of scale, a relatively high cost in accessing and utilizing information technology, accessing infrastructure, limitations in reaching quality standards, lack of skills and knowledge in dealing with customers both in the domestic or export markets (Burlea-Schiopoiu & Mihai, 2019; Henttonen & Lehtimäki, 2017; O. Brien & Hamburg, 2014; Temouri et al., 2020; Ye & Kulathunga, 2019).

The results of this study also complement the results of the previous ones that the implementation of TQM does not only need to fit like scale enterprises, commitment and empowerment (Gonzalez & Jiménez, 2013), organizational culture (Ahmadi et al., 2012; Al-Swidi & Mahmood, 2012; Hilman et al., 2020; Ojo, 2013), but also the purpose of market and competitive strategy (Ahmadi et al., 2012; Feizollahi et al., 2013; Kantardjieva, 2014; Ojo, 2013; Yunis et al., 2013). The results of this study found that the strategy of focus and differentiation are more appropriate for the implementation of TQM that supports previous research (Ahmadi et al., 2012; Feizollahi et al., 2013; Kantardjieva, 2014; Ojo, 2013; Yunis et al., 2013). The higher the quality will be in line with the increase in prices.

Table 2. Entrepreneurial Role on Efficiency

Parameter	Technical Efficiency (TE)		Economic Efficiency (EE)	
	β	ρ	β	ρ
Constant	0.011	0.769	-2,101 x 10 ⁶	0.000
D ₁	- 0.163	0.056	1,972 x 10 ⁶	0.035
D ₂	- 0.022	0.851	6,469 x 10 ⁶	0.000
D ₃	0.089	0.229	2,062 x 10 ⁶	0.012
R	0,235		0,743	
R ²	0,026		0,537	

Parameter	Technical Efficiency (TE)	Economic Efficiency (EE)
F test	1,869	39,350
Sig. F (p)	0,140	0,000

Note: D₁= technical quality, D₂= design quality, D₃= competitive strategy orientation

Source : primary data

In terms of economic efficiency, test results are obtained from the correlation coefficient (R) positive (0.743). It suggests the orientation of the unidirectional relationship. It means that if an exogenous variable implementation of technical quality (D₁), design quality (D₂) and competitive strategy (D₃) increases, the sales value of batik (Y) will also be increased above the industry average. The coefficient of determination (R²) is equal to 0.537 or 53.7%. It reflects that the implementation of technical quality (D₁), design quality (D₂) and competitive strategy (D₃) is able to explain whether the variation of the change is an increase or decrease of the endogenous variables (deviations optimal point) sales at 53.7%. While the rest by 48.3% is influenced by other variables that are not involved in this research model. Testing simultaneous equations with the goodness of fit (F-test) obtained F count of 39.350 ($\rho= 0.000$). It shows that the model fits the data.

In terms of economic efficiency (Table 2), variable entrepreneurial role in the implementation of technical quality (D₁) has a positive effect on operating revenues of batik (Y) ($\rho = 0.035 < 5\%$). The regression coefficient (β) = 1.972 x 10⁶ shows unidirectional relationship. It means that entrepreneurs that carry out the implementation of quality management has higher efficiency batik business income (Y) above IRD 1,972 million compared to the industry average entrepreneurs that lower carry out the implementation of technical quality.

The variable of implementation of design quality (D₂) has a positive effect on economic efficiency of batik (Y) ($\rho = 0,000 < 5\%$). The regression coefficient (β) = 6.469 x 10⁶ shows the relationship unidirectional. It means that export

market oriented entrepreneurs have business batik income (Y) more than Rp 6.469 million above the industry average compared to entrepreneurs who orient to local market.

Variable orientation of competitive strategy (D3) has a positive effect on operating revenues of batik (Y) ($\rho = 0,000 < 5\%$). The regression coefficient (β) = 2.062×10^6 shows unidirectional relationship. It means that entrepreneurs focusing on differentiation strategy or an income (Y) IDR 2,062 millions have higher income than the entrepreneurs who have a cost leadership strategy (Table 2).

Batik SME economic efficiency by the application of quality management and enterprise characteristics are presented in Table 3. The average efficiency of companies that apply quality management, and differentiation-focus strategy is higher than the average efficiency of companies that do not implement quality management, and low cost strategies orientation. The average technical efficiency implementing quality management is IDR 3.273 million or 10.33% above the efficiency frontier (the industry average). The average technical efficiency has IDR 8.121 million or 25.63% above the efficiency frontier. The average technical efficiency or differentiation focus strategy is IDR 4.695 million or 14.82% above the efficiency frontier.

The average of technical efficiency of companies that do not implement quality management is IDR 1,762 million, or 5.56% below the efficiency frontier (the industry average). The average of technical efficiency is IDR -1.322 million, or 4.17% below the efficiency frontier. The average production cost efficiency-oriented enterprises or differentiation focus strategy is Rp 4.695 million, or 4.68% below the efficiency frontier (Table 3).

The study found that the role of entrepreneurs in the implementation of technical quality (D_1), design quality (D_2) and competitive strategy (D_3) does not give positive and significant effects on the production efficiency (Y). However, the role of entrepreneurs in the implementation of quality management and the orientation of competitive strategy brings significant effect on revenues efficiency (Y).

Table 3. Economic efficiency of SMEs Batik based on Quality Management Adoption and the Company Characteristics

	Inefficiency Average (million/IDR)	Efficiency-Inefficiency Average (%)
A. Technical Quality		
No.	-1.762	-5.56
Available	3.273	10.33
B. Design Quality		
No.	-1.322	-4.17
Available	8.121	25.63
C. Strategy Orientation		
Managerial Cost	-1.483	-4.68
Focus, Differentiation	4.695	14.82

Source : primary data

This research has found that the role of entrepreneurs in the implementation of quality management has no significant effect on production efficiency. However, it brings significant effect on the efficiency of revenue. The results of this study found that the effect of the implementation of quality management is on both operating revenues.

These findings are in line with the previous research (Ali & Yusuf, 2019; Anil & K.P., 2019; Deshpande, 2019; Essel, 2020; Hilman et al., 2020; Mushtaq & Peng, 2020; Sahoo & Yadav, 2017; Sinha et al., 2016) by considering quality management as a leading management philosophy that enhances the position and performance of the company. Facing the free trade, it is a requirement to provide support for all products to perform quality management. Quality improves model of performance management through TQM applied in developed countries including the United States, Japan, Britain and other European countries. Nevertheless, in the free-market era, quality practices are also required on small and medium businesses in developing countries.

The results also show that TQM is a quality management system that can be implemented by small and medium enterprises. It can increase revenues as well as SMEs Batik. Yet, the results

of this study found that entrepreneurs who own batik and batik SNI (Indonesian National Standard) label are still below 10%. Batik artisans who have SNI and Batik label are still in a small number due to the low awareness to take care of standardization (64%) and the high cost of maintenance constraints (76%).

Batik SMEs that focus on the implementation of quality management for competitive strategy, the implementation of quality management are often constrained by economies of scale problems that small businesses have (Burlea-Schiopoiu & Mihai, 2019; Henttonen & Lehtimäki, 2017; O. Brien & Hamburg, 2014; Temouri et al., 2020; Ye & Kulathunga, 2019). Therefore, the model of alliances (horizontal and vertical) can be considered to deliver the potential benefits of economies of scale efficiency in the adoption of quality management (O. Brien & Hamburg, 2014). In the model of horizontal alliances, business groups can work together for quality planning (such as by building a brand, control design and environmental impact), quality testing (bring staff for testing quality standards batik or quality management consultants together will lead to lower costs). In the model of vertical alliances, company leaders focus on quality control and management, health insurance open to domestic and international markets. While, SMEs focus on meeting the product quality and timely delivery.

5. Conclusion

Based on the results of research on batik SMEs, it can be concluded that the implementation of design and technical quality management do not significantly increase efficiency, but it significantly increases revenue efficiency. The implementation of quality management significantly increases revenue especially in the focus and differentiation strategies.

Based on the results and discussion, this study has several recommendation as follows. (1) Batik business operators are required for the adoption of quality management. (2) The Government may provide convenience to the process of obtaining certification and quality certification and brand extension Batik Indonesia because it will help batik entrepreneurs to

compete in both local and global markets. (3) Economies of scale make SMEs inefficient for the adoption of quality management, so it becomes an obstacle to be competitive in a long term. SMEs must overcome obstacles economies of scale efficiency with cooperative/business group in both clusters and business networks, building vertical alliances within the related business group, or employ agents both through acquisition and contract-based resources. (4) Local government can provide incentives and guidance system to foster the development of new businesses for the implementation of quality management, especially in a short term. (5) The Association respectively strives acknowledgement from the government to assist Central Java batik artisans especially for services trade in Central Java. It also continues to encourage the artisans to consider SNI batik or well known as the Trade Mark (TM). (6) The Association of batik artisans encourage members about the importance of quality standards in the form of batik and batik SNI label.

This study has several limitations. First, this study uses a cross-sectional design approach through determinant analysis. Cross-sectional design based on a qualitative survey of Batik SMEs managers' experience and preferences. Cross-sectional design causes research to be unable to explain the influence of serial time, such as changes in policy, technology and dynamics of the social-economic environment. Second, research was conducted in Central Java, Indonesia, with homogeneous regulatory, geographical, social and cultural conditions. Research can produce different results with different regional characteristics (regulation, economic, social, technological). This study provides recommendations for future research, for research in other countries, other periods with different regulatory conditions, economy, social, technology.

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