

The Effect of Eco-Efficiency and Quality Management System on Firm's Performance: Moderating Role of Profitability and Leverage

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ABSTRACT

This study examines the effect of an eco-efficiency and quality management system on firm performance moderated by earnings per share (EPS) and leverage. The results of panel data regression found that the eco-efficiency and quality management systems did not directly affect firm performance. The results of the interaction effect test indicated that profitability strengthened the effect of the quality management system on firm performance, yet weakened the effect of the eco-efficiency on firm performance. However, the leverage did not reveal any interaction effect. This research only examined the eco-efficiency by identifying whether the firms had a green-finance certification or not. It also strengthens the results of the previous studies by building an integrated model facilitating the effect of eco-efficiency and quality management systems on firm performance by involving two moderators that had not been found in the previous studies. This study implies –for the revolution of industry 4.0 issues – the stakeholders should be encouraged to strengthen the green economy as an essential business aspect in Indonesia. This study also recommends the importance of sustainable firm managerial studies on green-finance issues and environmental aspects.

ABSTRAK

Penelitian ini menguji pengaruh sistem manajemen mutu dan eko-efisiensi terhadap kinerja perusahaan yang dimoderasi oleh earning per share (EPS) dan leverage. Pengujian dengan regresi data panel menemukan bahwa eko-efisiensi dan sistem manajemen mutu tidak berpengaruh secara langsung terhadap kinerja perusahaan. Pengujian efek interaksi menemukan bahwa profitabilitas memperkuat pengaruh sistem manajemen mutu terhadap kinerja perusahaan, tetapi di sisi lain justru memperlemah pengaruh eko-efisiensi terhadap kinerja perusahaan. Sementara itu, pengujian terhadap leverage tidak ditemukan adanya efek interaksi. Penelitian ini hanya mengobservasi eko-efisiensi melalui identifikasi ada tidaknya sertifikasi green-finance yang dimiliki perusahaan. Studi ini memperdalam penelitian sebelumnya dengan membangun model terintegrasi yang mengobservasi pengaruh eko-efisiensi dan sistem manajemen mutu terhadap kinerja perusahaan dengan melibatkan dua pemoderasi yang belum dijumpai pada riset-riset sebelumnya. Studi ini berimplikasi – untuk isu revolusi industri 4.0 – bahwa stakeholder harus menguatkan green economy sebagai aspek bisnis yang penting di Indonesia. Penelitian ini juga merekomendasikan pentingnya kajian manajerial perusahaan yang berkelanjutan dalam isu green-finance dan aspek lingkungan.

1. INTRODUCTION

The Digital era has created an industrial transformation that accelerates information distribution, and this demands the companies that they should be more competitive. Many people are

more familiar with the industrial transformation with the revolution of industry 4.0. The revolution of industry 4.0 has various impacts on firm performance, and it also benefits many companies. However, it is also a threat to firm performance.

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Firm performance has become such an issue that never stops the observation, and it has been studied by various parties. The firm's ability to maintain its performance is inseparable from its management system. Besides that, the revolution of industry 4.0 also encourages the acceleration of information distribution, while the ability to receive and process information is still relatively unequal. Therefore, it needs the application of the standard to help to process the information distribution equally.

Companies with a management system show that they have value standards, which become the basis of policy or management decision behavior. The firm's management system becomes an important issue because there is no research which measures the firm performance using the firm's management system approach integrated with eco-efficiency and interaction effects. Therefore, environment and quality management systems become strategic issues in researches on green-finance, which is still rarely observed in the context of Indonesia.

The process of environmental and ecosystem recovery leads to the emergence of eco-efficiency, which serves as the middle point between the economy and the environment (Osazuwa & Che-Ahmad, 2016). An environmental management system is proposed to help organizations overcoming their environmental problems in a more prominent and effective way.

The eco-efficiency strategy serves as a strategy used by management to reduce environmental impacts and ensure higher corporate value for the benefit of shareholders (Al-Najjar & Anfimiadou, 2012). The application of eco-efficiency shows the firm's concern for the environment, and the right application has an impact on environmental sustainability. By maintaining environmental sustainability, the firm is also maintaining its business sustainability. The strategies for improving social or environmental performance may increase the efficiency of a firm or even create a preferred position in the market than companies that are less environmentally responsible.

Kafetzopoulos, Psomas, & Gotzamani (2015) argued that the implementation of an international quality management system (TQM) was such a basic requirement for the firm's success and entry into the market. Quality management systems can be adopted by companies to improve competitiveness and product quality. Santos, Mendes, & Barbosa (2011) stated that the main benefit of quality system certification is on increasing the number of customers, delivery volume, profitability, and firm

productivity.

Globalization, which opens new access to the economy, has created markets with better information flow. In this case, product standardization is crucial for classifying firm products. According to Heras-Saizarbitoria & Boiral (2013), the development of management standards currently covered various aspects of business activities such as environmental management (ISO 14001) and quality management (ISO 9001). ISO standards include the definition of quality control through product design and processes, ongoing commitment to improving quality through business planning and operations.

Environmental degradation has threatened the survival of humans and the earth. The summit held in Rio de Janeiro in 1992 emphasized that environmental management was important for many organizations. An environmental management system was proposed to help organizations overcoming their environmental problems in a more prominent and effective way (Hazudin, Mohamad, Azer, Daud, & Paino, 2015). The growing popularity of ISO 14001 adoption has led to many studies to analyze the impacts of its application.

At present, the need to measure, evaluate, secure, and improve the quality of public and private companies in the manufacture of products and services is widely accepted by the public and government (Santos, Costa, & Leal, 2012). The ISO 9000 is a description of a series of quality management standards. The main standard of ISO 9001 is ISO 9001, which sets the requirements for achieving an efficient quality management system. The ISO 9001 standard provides guidance to companies with internal improvements and strategic benefits. The internal improvements are made to all business activities carried out in three parts of the planning, controlling, and documentation cycle. Therefore, the management standards (ISO 9001) have a crucial impact on the development of quality management and contributions to the existing quality management.

The results of previous researches on the firm's management system show an inconsistency in explaining the relationship with the firm performance. Therefore, there is a need to develop an integrated research model involving interaction (moderating) effects. To better understand the impacts of a quality management system and eco-efficiency on firm performance, this study adds two moderating variables in the research model. This is based on an argument that claims that the

characteristics of companies in generating profitability (measured by earnings per share (EPS)) and leverage (measured by debt ratio) may affect the relationship between eco-efficiency and quality management systems on the firm performance.

Companies with a high EPS accelerate the implementation of quality and environmental management systems as it brings impacts on capital efficiency and performance. Therefore, investors' confidence will be even greater. In addition, the availability of a good quality management system can reduce costs. This implies that the firm will get increased profitability and competitiveness.

Modigliani & Miller (1963) discussed leverage in the context of capital structure in the tax-based model. They argued that profitable companies deserved to borrow more money. It is due to the companies with a large capital structure being believed to be able to increase their productivity and performance. Therefore, profitability and leverage can affect the quality management system and eco-efficiency, which simultaneously increases firm performance.

The firm's valuation has only been based on its' financial performance. However, it is important to note that the implication of the firm's management system has the potential to lead to diverse perspectives on the firm's performance evaluation. This condition encourages the researchers to develop a research model by Osazuwa & Che-Ahmad (2016) by offering additional variables in measuring the firm performance. This variable is quality system management. In fact, there are still limited studies on the quality system management using indicators of the firm performance measurement. This condition motivated the researchers to conduct this present study.

The issue related to challenges, threats, and opportunities for entering the revolution of industry 4.0 is the focus of this research. For example, the impact of the revolution of industry 4.0 will create a new balance, including in the measurement of firm performance. It is expected that there is a shift in studies of fundamental analysis with a more dominant financial approach.

The transformation of the digital industry will benefit the information distribution that is increasingly fast and transparent. In doing so, the outcome of the firm's activities in the short, medium, and long terms will be an important and dominant indicator in measuring firm performance. This study specifically aims to analyze the moderating effect of profitability and leverage on the relationship between the quality management system and eco-

efficiency on firm performance through an integrated model.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

The Effect of Environmental Management System on the Firm's Performance

ISO 14001 is an international-based environmental management system where subsidized companies would follow the standards of five main components, including environmental policy, planning, implementation and operation, inspection and corrective actions, review, and improvement (Hazudin et al., 2015). The ISO 14001 standard was developed under a license from the International Organization for Standardization (ISO) in Geneva and had been facilitated by accredited certification bodies throughout the world. In relation to this standard, Heras & Arana (2010) explained that there are four benefits of ISO 14001 found in the literature, including producing an excellent environmental image of the firm, increasing support for companies to comply with laws and regulations, improving the firm's environment and alienating the firm's internal problems. By applying the ISO 14001 standard, a firm can acquire the skills for its human resources, enhance its reputation, information systems, and innovation.

Recently, a number of studies have analyzed the impact of applying ISO 14001 on firm value. However, the results have not been consistent. Al-Najjar & Anfimiadou (2012) had analyzed the relationship between environmentally friendly policies and corporate value in the UK for five years, using 201 companies. This study used ISO 14001 certification, corporate social responsibility (CSR), and companies listed on the BIE and FTSE4 indexes. The results showed a strong positive relationship between market prices and eco-efficiency. Dowell, Hart, & Yeung (2000) separated the sample of multinational companies in the US into three groups (companies that did not set international environmental standards, companies that had implemented US environmental standards on an international scale, and companies that adopted standards that were more stringent than requested by the US law). They found that companies adopting stricter environmental standards had a higher corporate value than those that did not. On the contrary, Che-Ahmad & Osazuwa (2016) found a positive relationship between eco-efficiency and the firm's value in Malaysian companies. In a study conducted by Hazudin et al. (2015), they found no significant effect on the firm's financial condition

before and after ISO 14001 certification. However, He, Liu, Lu, & Cao (2015) found similar results in China, where the application of ISO 14001 did not improve the firm's financial performance. Yet, the application of ISO 14001 provides implied non-financial benefits such as promoting exports and reducing environmental inspections imposed by the government. Based on the arguments above, the first hypothesis is proposed as follows:

H_{1a}: Eco-efficiency has a positive effect on firm performance.

The Moderating Effects of Profitability on the Relationship between Eco-Efficiency and the Firm's Performance

Companies implementing eco-efficiency can increase the firm value because it is strengthened by their profitability, which can increase profits in the future. An organization can achieve profitability by taking advantage of economies of scale or even by eliminating all overhead costs that do not add value to products and services.

Profitability allows the management to be flexible and free in implementing and presenting better social responsibility programs to the shareholders. Research findings by Che-Ahmad & Osazuwa (2016) also provided evidence that profitability increased the firm value. Therefore, these companies would be motivated to pursue ISO 14001 as an indication of the environmental efficiency needed by sensitive investors. These results indicated that profitability could positively moderate the relationship between eco-efficiency and firm performance. For these reasons, a hypothesis can be proposed as follows:

H_{1b}: Profitability moderates the effect of eco-efficiency on firm performance.

The Moderating Effect of Leverage on the Impacts of Eco-Efficiency on Firm Performance

Leverage is the most influential factor in finance for investment policy. It has a negative effect on firm growth because it can improve the firm's performance. It can be done in several ways, such as preventing managers from taking on projects that will endanger the firm. However, the positive effect of leverage is that it can moderate the relationship between environmental policy and firm performance.

Modigliani & Miller (1958) and Jensen (1986) argued that profitable companies signaled the firms' quality by increasing debt resulted in a positive

relationship between leverage and profitability. In this case, capital structure is the key to increasing a firm's productivity and performance. The use of debt by companies encourages corporate awareness to protect the environment as a form of responsibility to the public and shareholders. This shows that leverage can positively moderate the relationship between environmental efficiency and the firm's performance. In line with the above argument, a hypothesis can be proposed as follows:

H_{1c}: Leverage moderates the effect of eco-efficiency on firm performance

The Effect of Quality Management System on the Firm's Performance

ISO 9001 is an international standard on quality management systems, and it is often referred to as ISO 9001: QMS. The standard in the quality management system of ISO 9001: 2008 focuses on the effectiveness of the sustainable development process with PDCA (plan, do, control, and act) mindset as the central pillar. Every process requires careful planning and precise implementation. Therefore, any problems in the organization can be resolved immediately.

The ISO 9001 standard has an essential impact on the development of quality management and provides the most influential contribution to quality management (Heras-Saizarbitoria, 2011). By adopting ISO 9001, companies can benefit in the form of increased sales, return on investment, market share, and sales per employee. Further, it helps reducing logistics costs, improving supplier relations, improving inventory turnover and compliance with delivery dates, and cutting waiting times, including loyalty purchases, customer satisfaction, and fewer complaints.

There are a number of studies examining the impact of the application of ISO 9001 on companies. However, the results they found are not consistent yet. Santos et al. (2012) stated that industrial companies with ISO 9001 had faster investment returns than other companies. Al-Refaie, Ghnaimat, & Li (2012) also revealed that the requirements and ISO 9001 guidelines could improve the efficiency and effectiveness of quality management systems in Jordanian companies, but they failed to motivate innovation. However, Psomas, Pantouvakis, & Kafetzopoulos (2013) examined companies in Greek and found that product quality and operational performance of service companies were directly and significantly affected by the effectiveness of ISO 9001. However, the financial performance was

directly affected only by operational performance, while the impact of the effectiveness of ISO 9001 was indirect through a significant correlation with the operational performance. The results of a study conducted by Kafetzopoulos et al. (2015) showed that the ISO 9001 had a positive and significant influence on product quality and firm operational performance, but it had a negative and significant effect on business performance in manufacturing companies. Bakator & Čočkaló (2018) also found that applying ISO 9001 could improve the companies' operational performance, customer satisfaction, financial performance, and overall business performance.

A different result was also found in a study by Ilkay & Aslan (2012), which examined companies in Turkey. They found no statistical differences between certified companies and those that are not on profitability, turnover, inventory turnover, reprocessing costs, capacity utilization rates, damaged product ratios, production time, level of employee satisfaction, number of complaints from customers, level of customer satisfaction, number of product customers returns, on-time delivery, speed of technical service response, competitive position, regular training for employees, and cost savings. (Cândido, Coelho, & Peixinho, 2016) also found no significant differences in the firm performance between companies that were ISO 9001-certified and those which were not in Portugal. Therefore, a hypothesis can be proposed as follows:

H_{2a}: Quality management system has a positive effect on firm performance.

The Moderating Effect of Profitability on the Impact of Quality Management System on the Firm's Performance

Profitability is a number of the firm's policies and decisions for-profit purposes. This ratio is an essential factor because a firm must be in a favorable condition so that they can survive. Without profit, it will be challenging for companies to attract external capital. Small capital tends to have a negative effect on firm productivity. Quality management system support is low in terms of the quality of the firm's products. This can lead to the firm having a low value too. In other words, companies with high profitability could guarantee their quality management system and simultaneously lead to an increase in their value.

According to Heras, Dick, & Casadesús (2002), an effective quality management system would result in better product quality and performance.

When the product quality is improved, the efficiency increases, and so does the firm's performance. Heras et al. (2002) stated that excellent product quality was related to sales growth and sales margins. They added that by obtaining the quality certification-- which was expected to be perceived as a good signal by the market-- the firm's quality and business performance would be better, thereby potentially driving the profitability indirectly. This indicates that profitability can positively moderate the effect of the quality management system on the firm's performance. For that reason, the hypothesis can be proposed as follows:

H_{2b}: Profitability moderates the effect of quality management systems on firm performance.

The Moderating Effect of Leverage on the Impact of Quality Management System on the Firm's Performance

Leverage shows the level of the firm's financial risk. The higher the level of leverage, the higher the proportion of debt used so that the financial risk increases. Companies that have high leverage will also face high risks. Therefore, appropriate management policies are needed to improve production quality. Robb & Robinson (2014) argued that the leverage significantly influenced the firm's profits, and the use of debt could improve the firm's performance.

In addition, Ibhagui & Olokoyo (2018) found that leverage positively influenced Tobin-Q and the firm (market) performance. Cheng & Tzeng (2011) confirmed that leverage was positively related to the firm's value before achieving an optimal capital structure. The researchers assume that with reasonable control from the firm, the use of debt can provide better benefits. This condition shows that leverage can positively moderate the effect of quality management system on the firm's value. For that reason, the hypothesis can be proposed as follows:

H_{2c}: Leverage moderates the effect of quality management systems on firm performance.

3. RESEARCH METHOD

This is a quantitative study with a population of all 561 companies listed on the Indonesia Stock Exchange in 2017. The sample was selected using a purposive sampling technique. The sample should meet the following criteria: first, the companies should be listed on the Indonesia Stock Exchange; second, the companies must have annual report data from 2012 to 2017; and third, the companies must have the application of the quality management

system and the environmental management system from 2012. Based on the criteria, there were only 75 companies that could be used as the research sample.

This study used panel data and E-views software. Winarno (2009) stated that "...[the] panel data model has similarities with the multiple linear regression model. Both have the same goal, [which is] to predict parameters." Widarjono (2013) added that "...there are three models of approaches to

determine the prediction of parameters, including common effect, fixed effect, and random effect." In determining the model used, this study conducted several tests. Widarjono (2007: 258) also mentioned that there are three tests serving as measurements in determining the panel data estimation technique, such as Chow, Hausman, and Lagrange Multiplier (LM) test. The following are research models developed in this study:

$$\begin{aligned} \text{Model 1: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{ECO} + \beta_4\text{LEV} + \beta_5\text{EPS} + \varepsilon \\ \text{Model 2: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{ECO} + \beta_4\text{LEV} + \beta_5\text{EPS} + \beta_6\text{ECO*LEV} + \beta_7\text{ECO*EPS} + \varepsilon \\ \text{Model 3: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{TQM} + \beta_4\text{LEV} + \beta_5\text{EPS} + \varepsilon \\ \text{Model 4: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{TQM} + \beta_4\text{LEV} + \beta_5\text{EPS} + \beta_6\text{TQM*LEV} + \beta_7\text{TQM*EPS} + \varepsilon \\ \text{Model 5: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{ECO} + \beta_4\text{TQM} + \beta_5\text{LEV} + \beta_6\text{EPS} + \varepsilon \\ \text{Model 6: ROE} &= \alpha_0 + \beta_1\text{BV} + \beta_2\text{IO} + \beta_3\text{ECO} + \beta_4\text{TQM} + \beta_5\text{LEV} + \beta_6\text{EPS} + \beta_7\text{ECO*LEV} + \beta_8\text{ECO*EPS} + \beta_9\text{TQM*LEV} + \beta_{10}\text{TQM*EPS} + \varepsilon \end{aligned}$$

Which: ROE (Firm's Performance), Control Variables (BV – book value ; IO – institutional ownership), ECO (Eco-Efficiency – ISO 14000/14001, dummy of 1 and 0), LEV (DR – total debt ratio), EPS (Profitability), TQM (Total Quality Management – ISO 9000/9001, dummy of 1 and 0), α (intercept), ε (residual).

4. DATA ANALYSIS AND DISCUSSION

Based on Table 1, the average ROE value is 10.2318%, and it indicates the firm's performance was weak during the research period. The quality management system and eco-efficiency as the focus variables have an average value of 0.95 and 0.96, respectively, and it shows that 95% and 96% of sample companies were companies that implemented a quality management system and eco-efficiency from 2012. The average value of

institutional ownership of 64.79% indicates that most of the sample companies were owned by institutions. The EPS average value of 168.750 shows that it was such a small result. The average debt ratio of 50.91% shows that 50.91% of the firm's assets were guaranteed from debt, and parts of the firm's capital structure were based on the debt. Finally, the standard deviation shows that most of the variables were stable and reliable.

Table 1
Descriptive Statistics

Var	Mean	SD	Min	Max
ROE	10.2180	41.0620	-233.7100	350.3000
TQM	0.9500	0.2200	0.0000	1.0000
ECO	0.9600	0.2010	0.0000	1.0000
BV	2,065.5510	4,163.4720	-630.6600	47,740.2500
IO	64.7910	20.7390	0.0800	98.8500
EPS	168.7500	1.1900	-231.2700	17,6210
LEV	50.9120	23.3400	3.8700	157.1100

Based on the results of the correlation analysis in Table 2., it can be concluded that there was no multicollinearity. In addition, the results of the Variance Inflation Factor (VIF) test on all the models studied was above 10, indicating that the model did

not have any multicollinearity.

The results of model feasibility can be seen in Table 3. The result of Chow, Hausman, and Lagrange Multiplier tests determined whether the model was a common effect, fixed effect, or random effect. The

results show that the best research model was a random effect for all research models.

H1a predicts a positive effect between eco-efficiency and the firm’s performance. Model 1 and Model 2, respectively explain changes in the firm’s performance by 42.3% and 42.8%. These results indicate that the eco-efficiency variable had a negative and not significant effect on firm performance. Thus, H1a is not supported empirically. The results of this study are in line with He et al. (2015), who also found that the application of eco-efficiency had no impact on improving the firm’s

performance. It was due to the economic activities and companies in Indonesia, which were still very dependent on nature. Therefore, the application of environmentally friendly systems would have an impact on decreasing the firm’s performance.

In Model 2, the EPS was found to have a positive effect on the firm’s performance, and negatively moderated the relationship between eco-efficiency and the firm’s performance. It is due to the determination of the management system in Indonesia where the economic support was dominated by natural products.

Table 2
Correlation

	ROE	TQM	ECO	BV	IO	EPS	LEV
ROE	1.0000						
TQM	-0.0450	1.0000					
ECO	-0.0850	0.0520	1.0000				
BV	0.1700	0.0800	-0.0230	1.0000			
IO	-0.0240	-0.0270	0.0780	0.1260	1.0000		
EPS	0.6460	0.0460	-0.0470	0.5310	-0.0670	1.0000	
LEV	-0.0560	-0.0170	-0.1160	0.1470	-0.0590	-0.2180	1.0000

Table 3
Multiple Regression Analysis

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control						
BV	-0.3750** (0.0000)	-0.3760** (0.0000)	-0.3720** (0.0000)	-0.3830** (0.0000)	-0.3700** (0.0000)	-0.3780** (0.0000)
IO	0.0240 (0.8280)	0.0270 (0.8020)	0.0220 (0.8440)	0.0240 (0.8210)	0.0200 (0.8540)	0.0240 (0.8160)
Independent						
ECO	-0.3090 (0.1870)	2.8500 (0.1240)			-0.3160 (0.1770)	2.5550 (0.1440)
TQM			-0.3450 (0.1570)	-2.2270 (0.2410)	-0.3520 (0.1480)	-2.2520 (0.2330)
Moderators						
EPS	0.4460** (0.0000)	0.7020** (0.0000)	0.4430** (0.0000)	0.0640** (0.2970)	0.4450** (0.0000)	0.3680** (0.0010)
LEV	0.3330* (0.0150)	0.9240* (0.0380)	0.3090* (0.0240)	0.2480 (0.5830)	0.3130 (0.0230)	0.7070 (0.2470)
Interaction						

ECO-LEV							-0.5920 (0.1810)	-0.4280 (0.3050)
ECO-EPS							-0.2620* (0.0160)	-0.3150** (0.0020)
TQM-LEV							0.0020 (0.9970)	-0.0180 (0.9680)
TQM-EPS							0.4350** (0.0000)	0.4380** (0.0000)
R-squared	0.4290	0.4370	0.4290	0.4900	0.4320	0.5020		
Adjusted R-squared	0.4230	0.4280	0.4230	0.4820	0.4240	0.4910		
F	66.7290	49.0200	66.8350	60.6500	56.1270	44.2550		
CHOW TEST	363.2230**	365.6090**	366.2510**	401.3920**	365.8860**	404.9160**		
HAUSMAN TEST	9.2520	10.8160	9.7570	12.1360	9.7540	13.6930		
LM TEST	220.9390**	220.2210**	223.1280**	258.7530**	222.5390**	257.5610**		

Note: *, and **, represent significance at 5% and 1% respectively.

Generally, the profit could improve performance, but when it was moderated, it showed that the system application was negatively related because the research context or objects were mostly dominated by natural products. On the contrary, in implementing the management system, the profits would reduce the firm's performance due to exploitation or increased sales of natural products. This research does not

Which only examined the fundamental indicators where the profit should be linear and positive on the performance. The application of excess profits actually reduced the firm's performance.

The debt variable was found to have a positive effect on improving the firm's performance. The research context in developing countries with the implementation of enterprise management systems such as environmental and quality management did not sustain firm performance. For example, in Indonesia - a developing country whose economic dominance was supported by natural products, the use of debt helped companies actually get additional pressure to produce performance. Therefore, to meet their duties, the firms would improve their performance and simultaneously bring impacts on increasing environmental damage.

Next, the debt ratio was found unable to moderate the relationship between eco-efficiency and firm performance. This was because the research context was in a developing country. Therefore, its

governance especially in terms of supervision ensures that the consistency and commitment of companies were not optimal due to limited resources.

Model 3 and Model 4 explained changes in the firm's performance of 42.3% and 48.2%, respectively. In the model, no significant effect was found between the quality management system and the firm's performance. Therefore, H2a is not supported empirically. The results of this study are in line with studies conducted by Ilkay & Aslan (2012) and Cândido et al. (2016). The insignificance of the relationship between the management system and the firm performance of this study was due to weak human resources available in developing countries, causing the implementation of quality management to fail to improve the firm performance.

In Model 4, a test was conducted on the moderating variable, and the EPS was found to be positively and significantly moderate the relationship between the quality management system and the firm's performance. This confirms that H2b is supported empirically. The role of profit was able to strengthen the influence of applications and bring the firm closer to the fundamental goal of implementing a quality management system that could improve firm performance. This condition was in accordance with the theoretical study, which stated that the implementation of a quality management system would improve the performance because the research context was in a developing country where economic equality had not yet achieved. The higher the profit,

the more able the company to maintain quality or realization of the firm's quality management system aiming to create the firm performance. Meanwhile, the test results show that the debt ratio did not moderate the relationship between the quality management system and firm performance. Therefore, H2c is not supported empirically.

Model 5 and Model 6, respectively explained changes in the firm performance by 42.4% and 49.1%. The results show that the eco-efficiency and quality management systems simultaneously had no effect on the firm performance as measured by ROE. In Model 6, the results showed that the EPS moderated a negative and significant relationship between eco-efficiency and performance, and it positively and significantly moderated the relationship between the quality management system and firm performance. The results also explained that the debt ratio did not moderate the relationship between eco-efficiency and quality management systems on firm performance. Finally, the F-statistic value of all the models examined was significant, indicating that the model was worthy of research.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study aims to examine the effect of profitability and leverage on the relationship between eco-efficiency and quality management systems on the firm's performance. It used a multiple linear regression model. The main findings obtained indicates that the environmental efficiency and quality management systems did not directly affect the firm's performance as measured by return on equity. This study also found a negative relationship of profitability in moderating the relationship between environmental efficiency and the firm's performance. This showed that in implementing a management system (14001) the companies should allocate a portion of profits in the long run and be charged because it was periodic and sustainable due to the adoption of a relatively expensive management system.

Profitability was also found to positively moderate the relationship between quality management and performance. Meanwhile, leverage (measured by debt ratio) did not show the role of moderation in the environmental efficiency or quality management systems. Therefore, the application of the environmental management system or quality was not influenced by the level of corporate debt. This condition was caused by the application of the management system (14001), which required inexpensive costs. Thus, if a firm

implemented a management system using a source of debt, it would result in expenses such as interest. The profitability positively moderated the quality management system and the firm's performance because the companies that are increasingly able to generate profits could also improve their performance. These results are in line with a study by Heras et al. (2002), which supported that the companies implementing a management system (9001) could also maintain their product quality to improve their firm's performance and margins. The companies implementing a management system (9001) might also improve their work efficiency and profitability reflected in good waste management to improve their firm performance.

The theoretical implication referring to the results of the main objective of the study indicates that environmental and quality management systems do not affect the firm's performance differently from the developing theories. However, the test with the profitability as the moderating variable also has a theoretical contribution where the implementation of environmental management systems in the research context of a developing country is in a negative relationship. This means that the implementation of an environmental management system in developing countries such as Indonesia can reduce the firm's performance because the main activities that sustain the Indonesian economy are still from the exploitation and processing of natural products.

The practical implication of this study is related to the research context, which was in a developing country whose interest was in responding to the revolution of industry 4.0. Dominant activities supporting the economy of developing countries such as Indonesia are very vulnerable to global strategic issues concerning the green economy. The government, as the main stakeholder, plays an important role proactively with other stakeholders in formulating in detail and in-depth on the certification of the firm's management system. The government needs to consider solutions to various state bans with a variety of strategic issues that hinder the firm activities. The government also needs to seek special oversight bodies that are globally integrated so that the certification of management systems can be a solution to various trade barriers. Finally, it can provide added value and increase the companies' competitiveness.

The managerial implication of this study is based on the main tests where the environmental and quality management system had no effect on the firm's performance. The management of the

companies needs to consider and review the implementation of the firm management so that it provides benefits in accordance with the fundamental objectives of its implementation, although they are in Indonesia – a developing country. Generally, developing countries have limited resources in supporting the effectiveness of system implementation. The results of the study provide managerial implications for accelerating the adaptation and adoption of management systems in optimizing the benefits of industrial transformation due to digitization.

In this study, the researchers used companies listed on the Indonesia Stock Exchange. In the future, it is suggested that companies from other countries' exchanges, especially developed countries, are used, and future researchers are suggested to extend the research period to get more consistent results. In addition, it is recommended they use other variables as a measurement of financial performance. Future studies can consider comparing firms' management system practices between developed and developing countries.

Limitations of this research in identifying the firm management systems are as follows: because it was only based on firm registration in the form of certification, the commitment and consistency of the firm's management system application are only based on the decisions and evaluation of the certification assessment team. This study only focused on measuring the implementation and even commitment of the firm in relation to its management system through its certificates of registration. It did not use a more objective measurement that reflected the consistency of the firm in implementing its management system.

The phenomenon of a digital transformation has become a global topic and discussion in the emergence of the revolution of industry 4.0. This has become the research novelty. The novelty is especially in the measurement of performance that is different from most studies that have only focused on the financial approach. This research's focus is on the application of environmental and quality management systems, which believes that both systems will have a long-term impact on the fundamental improvement.

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