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Relationship of quality management system standards to industrial property rights in Indonesia using Spearman Correlation Analysis Method

A Bakhtiar^{1*}, H Suliantoro¹, R H Ningsi¹, K Pitipaldi¹

¹ Department of Industrial Engineering, Universitas Diponegoro, Semarang, Indonesia

arfanbakhtiar@lecturer.undip.ac.id

Abstract. This study examines the relationship between *SNI* ISO Quality Management System (QMS) Standards to Industrial Property Rights in Indonesia using Spearman Correlation Analysis. The focus of research is on the comparison of the correlation coefficient value of quality management system standards: *SNI* ISO 9001 QMS, *SNI* ISO 14001 EMS, *SNI* ISO 22000 FSMS, *SNI* ISO 13485 MD-QMS, *SNI* ISO 27001 ISMS, *SNI* ISO 16949 A-QMS with industrial property rights: patents, simple patents, industrial designs and brands in Indonesia. The test conducted was to see the data relationship between the number of QMS standard certificates to Indonesia's industrial property rights for seven years, starting from 2009 to 2015. The Spearman Correlation method analyzes the correlation coefficient value on the development of certificate data held in Indonesia. The Spearman correlation test results show that several QMS standards have significant values that have entered the tolerance limit or have gone out of the tolerance limit for industrial property rights. This evidence suggests several quality management system standards able to contribute to the development of innovation in a country, especially Indonesia.

1. Introduction

Industrial property rights (IPR), including brands, patents, industrial designs and copyrights, are used as rights granted by the state to an individual or several people for their work on new products or services resulted [1,2]. Meanwhile, innovativeness is defined as a person's tendency to learn something new. Therefore innovativeness is used as a parameter to measure the ability to develop a new product [3]. Companies that produce a new product tend to develop their technology. However, several companies tend to buy technology from abroad, which indicates a weak level of protection of intellectual property rights [4]. Although the role of intellectual property rights in economic growth in a country is not very clear theoretically and empirically, research conducted by Gould (1996) recommends that the stronger the intellectual property rights, the higher the country's economic growth [5]. On the other hand, Chen's (2005) research reveals a linear relationship between the application of intellectual property rights protection and the development of a country [6].

Several studies have concluded that the most popular quality management system philosophies are based on ISO 9000 and Total Quality Management, but TQM is static, while ISO 9000 certification will always develop. ISO 9000 focuses on the overall Quality Control (QC) system from the product design process to the after-sales or warranty service process. Therefore ISO 9000 as an international standard based on a quality management system has become a major subject in the development of many



countries [7]. It will be fascinating if not only a company develops innovation, but a country also conducted the innovation movement. For example, as a developing country, Indonesia has experienced an increase and decrease in its innovation level's rank from 2013 to 2016. From a survey conducted by the Global Innovation Index, Indonesia has increased its ranking from number 87 in 2014 and decreased in 2015 to rank 97. For 2016, Indonesia experienced an increase in ranking and managed to rank 88 among other countries in the world. For ISO certification, Indonesia is always below other ASEAN countries in terms of the number of certificates produced.

Looking at the data on the number of QMS certificates produced by all ASEAN countries, Indonesia only produces 16.02%. It is equal to 57963 ISO quality management system certificates from the total ISO 9001 QMS, ISO 22000 FSMS, ISO 14001 EMS, ISO 13485 MD-QMS certification, ISO 27001 ISMS and ISO 16494 A-QMS from all other ASEAN countries. This percentage is lower than other ASEAN countries such as Thailand, which produced 26.95% or 97460 certificates, in slight contrast to Malaysia, which produced 26.18% or as many as 94582 certificates. Meanwhile, Indonesia outperformed Singapore, Vietnam and the Philippines with 13.81% or 49917 certificates they produced. For example, the food safety management system (ISO 22000 FSMS), environment management system (ISO 14001 EMS), medical device quality management system (ISO 13485 MD-QMS) [8]. The relationship between the quality management system and innovation (IPR) is examined further in this paper, focusing on examining whether the application of quality management systems is correlated with the number of intellectual property rights obtained.

According to the literature studied, there is an indication that international standards of quality management systems with intellectual property rights can develop a country [5, 6]. Consistency and systematic change could impact competent companies and have a relationship with more consistent development, process management, customer orientation, human development management, and all levels of management to be dedicatedly involved in the overall quality management and innovation process [9]. However, research conducted by Terziovski (2014) reveals that ISO 9000 certification has a negative impact on product innovation because ISO 9000 must pay attention to the legal details of the government rules stated in the ISO 9000 certificate [10]. In other words, when companies pay attention to the details of ISO 9000 and increase compliance with regulations ISO 9000, it has a negative impact on innovation. On the contrary, the quality management system is widely accepted as a management model that provides excel competition if successfully implemented.

2. Methodology

When market conditions change, quality becomes one of the factors that meet the requirements: flexibility, responsiveness, and innovation to take over the criteria for winning market competition [11]. A Spearman Correlation Test was carried out to see the relationship between the development of QMS standard certificates and the development of industrial property rights certificates. The test uses the data on the number of QMS standard certificates: *SNI* ISO 9001 QMS, *SNI* ISO 14001 EMS, *SNI* ISO 22000 FSMS, *SNI* ISO 13485 MD-QMD, *SNI* ISO 27001 ISMS and *SNI* ISO 16949 A-QMS and their respective industrial property rights, namely patents, simple patents, industrial designs and brands for seven years starting from 2009 to 2015.

This study uses two main variables, which are industrial property rights and quality management system standards. The variable of Industrial Property Rights is divided into several sub-variables, which represent innovations such as patents, simple patents, industrial designs and brands. Meanwhile, the Quality Management System Standard is divided into six variables that have been adjusted based on the research results. The sub-variables are *SNI* ISO 9001 QMS, *SNI* ISO 14001 EMS, *SNI* ISO 22000 FSMS, *SNI* ISO 13485 MD-QMD, *SNI* ISO 27001 ISMS and *SNI* ISO 16949 A-QMS.

This study's conceptual model refers to Basaran (2016) [8], which is divided into three analyzes. This conceptual model aims to examine the relationship between each number of sub-variables certificates for the quality management system standard, namely *SNI* ISO 9001 QMS, *SNI* ISO 14001 EMS, *SNI* ISO 22000 FSMS, *SNI* ISO 13485 MD-QMD, *SNI* ISO 27001 ISMS and *SNI* ISO 16949 A-QMS with each sub-variable number of industrial property rights certificates, namely patents, simple patents,

industrial designs and brands. This conceptual model tries to identify whether every quality management system standard applied in a company could impact the development of industrial property rights. Based on the conceptual model developed (as seen in figure 1), the research hypothesis is obtained as follows, H_0 : There is no correlation between quality management system standards and industrial property rights. H_1 : There is a correlation between the quality management system standards and industrial property rights. 2-way test with rejection regions $H_0: -\rho < -\alpha$ and $\rho > \alpha$.

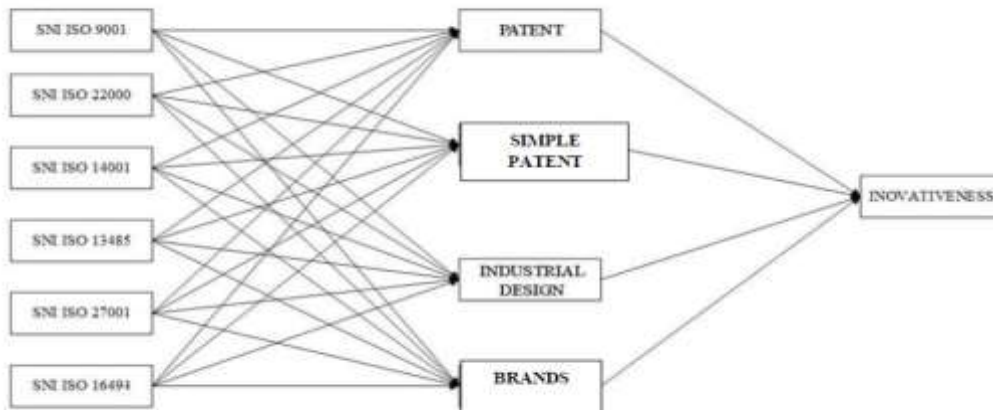


Figure 1. Conceptual model.

3. Results and discussion

A series of ISO and Intellectual Property datum was obtained after the survey was conducted, shown in the table below.

Table 1. Quality management system standard and industrial property rights.

ISO/year	2009	2010	2011	2012	2013	2014	2015
SNI ISO 9001 QMS (X1)	5476	6524	3999	5392	7890	7150	8613
SNI ISO 14001 EMS (X2)	794	1028	873	1035	1558	1644	2239
SNI ISO 22000 FSMS (X3)	184	239	183	222	262	311	413
SNI ISO 13485 MD-QMS (X4)	7	7	5	22	53	32	34
SNI ISO 27001 ISMS(X5)	13	22	29	35	48	62	65
SNI ISO 16494 A-QMS (X6)	156	168	182	201	231	261	301
Industrial Property Rights/ Year	2009	2010	2011	2012	2013	2014	2015
Patent	475	604	675	822	882	949	1148
Simple Patent	98	113	126	102	134	145	153
Industry Design	1580	1651	1780	1914	1988	1755	1687
Brands	16189	19356	22896	27583	27482	26634	26026

The Spearman Correlation statistical test was carried out to determine the correlation between Indonesia's quality management system standards and industrial property rights. The Spearman Correlation statistical test for this study was conducted using SPSS software. Each statistical test is carried out based on the provisions obtained from the existing conceptual model. A summary of the calculation results is presented below.

Table 2. Spearman correlation statistical result.

Variable	r (rho)	sig.	Indication n=7
X1 Patent	0.679	0.094	no correlation
Simple Patent	0.714	0.071	no correlation
Industry Design	-0.036	0.939	no correlation
Brands	0.179	0.702	no correlation

	Variable	r (rho)	sig.	Indication n=7
X2	Patent	0.964	0	correlated
	Simple Patent	0.857	0.014	correlated
	Industry Design	0.321	0.482	no correlation
	Brands	0.607	0.148	no correlation
X3	Patent	0.821	0.023	correlated
	Simple Patent	0.786	0.036	correlated
	Industry Design	0.036	0.939	no correlation
	Brands	0.357	0.432	no correlation
X4	Patent	0.775	0.041	correlated
	Simple Patent	0.613	0.144	no correlation
	Industry Design	0.414	0.355	no correlation
	Brands	0.631	0.129	no correlation
X5	Patent	1	0	correlated
	Simple Patent	0.893	0.007	correlated
	Industry Design	0.429	0.337	no correlation
	Brands	0.643	0.119	no correlation
X6	Patent	1	0	correlated
	Simple Patent	0.893	0.007	correlated
	Industry Design	0.429	0.337	no correlation
	Brands	0.643	0.119	no correlation

The table above confirms that each sub-variable calculation results of the QMS standard: *SNI ISO 9001 QMS*, *SNI ISO 14001 EMS*, *SNI ISO 22000 FSMS*, *SNI ISO 13485 MD-QMD*, *SNI ISO 27001 ISMS* and *SNI ISO 16949 A-QMS*, do not correlate with industrial designs and brands.

Referencing the amount of data owned by the industrial property rights sub-variable (table 1) proves that the brand for seven years has an insignificant impact on the calculation results. This insignificant result is based on the vast number of brand certificates yielded for seven years. Therefore, if calculation with other management system standard sub-variables is done, it has no influence/correlation. In sum, for the industrial property rights sub-variable, brands always produce insignificant value when compared to the quality management system standard sub-variable, which has a small amount of data. Brands are important for competition in winning customers' hearts, but brands are also identical to the characteristics of companies that already have certain market segmentation. It shows why the calculation results of brands do not significantly affect industrial property rights [12].

The nature of the increase and decrease in data for the industrial property rights sub-variable, namely industrial design and brand for seven years, tends to be the same. Industrial property rights that show industrial designs and brands at the beginning of the period always experience an increase, and then at the end of the period, it has decreased [10,13]. These results indicate that innovation should be integrated into the industrial design because it will positively affect company performance [14] and increase competition between companies [13]. Conversely, if it is related to the nature of the data from each sub-variable of the QMS standard, it will not decrease at the end of the period and continue developing. Therefore, industrial design and brand cannot have a correlation with each sub-variable of the quality management system standard because the nature of the data development is significantly different. It proves that the brand should not be associated with standards because every company or every individual who owns a business must have a brand to support its business activities [2,15]. Meanwhile, the quality management system standard is more voluntary in that every business actor is not required to have a quality management system standard in conducting his business activities. Likewise, in industrial design, quality management system standards are made by avoiding prescriptive nature, giving instructions or provisions [16] and depending on the official provisions implemented the production process such as making an industrial design [17].

Investigating at the nature of the time series data for *SNI ISO 9001 QMS* for seven years, there has been an uncertain increase and decrease. ISO quality management system standard, *SNI ISO 9001 QMS* for seven years, tends to increase and decrease irregularly. The industrial property rights sub-variables,

namely patents and simple patents for seven years, tended to increase from the beginning of 2009 to 2015. Therefore, the nature of the time series data for *SNI ISO 9001 QMS* for seven years tends to increase and decrease irregularly. It impacts the absence of a correlation between *SNI ISO 9001 QMS* and patents, simple patents, industrial designs, and brands, which tend to increase or decrease at the end of the period. Fundamentally, the nature of the time-series data from the industrial property rights sub-variables, namely patents and simple patents, tends to increase in each period. Only the variable of simple patents in 2012 experienced one decline and then increased again until the end of the period. The time-series data characteristics are the same as *SNI ISO 14001 EMS*, *SNI ISO 22000 FSMS*, *SNI ISO 13485 MD-QMS*, *SNI ISO 27001 ISMS* and *SNI ISO 16494 A-QMS*. Because of the nature that tends to increase over seven periods, the quality management system standard sub-variable correlates with the patent and simple patent sub-variables according to the Spearman Correlation calculation. It proves that patents have a strong effect on the protection function of industrial production [18,19]. Therefore, efforts to strengthen the patent function should be conducted by updating research that continues to highlight the unique characteristics of each industrial product yielded.

4. Conclusion

This paper discusses the first conceptual model for investigating the relationship between Quality Management System and Industrial Property Rights; of the 24 correlations studied, only five correlations were found. These correlations are (a) *SNI ISO 14001 EMS* correlates with patents with a strong correlation level, and simple patents with moderate correlation levels, (b) *SNI ISO 22000 FSMS* correlates with patents and simple patents with the same moderate level of correlation, (c) *SNI ISO 13485 MD-QMS* correlates with patents with a moderate level of correlation, (d) *SNI ISO 27001 ISMS* correlates with patents with a perfect correlation level and simple patents with moderate levels of correlation, and (e) *SNI ISO 16494 A-QMS* correlates with patents with a perfect correlation and simple patents with a moderate degree of correlation.

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