# The Mapping on Standards Capability and Response to Standards Issues:

## A Multiple Case Study in Manufacturing Firm-Indonesia

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**Abstract–According to the ISO methodology to quantify the benefits of standards, the standards capability is one of the influencing factors to the value creation process of the application of standards. The objectives of this study are twofold, i.e. to observe how the application of standards in manufacturing industry companies is, and to assess both of the standards capability and the respond to standards issues. Based on the case study findings, we concluded that: the application of standards have deeply and systematically been understood and done in all departments and levels of the companies. Meanwhile, figures of the case study objects have explained a reactive response to the issue of new standards and the companies' standards capabilities are scored high. So, they can be categorized as follower.**

***Keywords-Standards, Capability, ISO Methodology, Mapping***

## I. INTRODUCTION

The role of standards in business activities has been widely recognized by researchers, industrialists and businessmen. The standards role plays as a language to communicate between producers and consumers. Through the standards, manufacturers will define the characteristics and specifications of the product either after the needs of the consumer are understood (customer driven) or based on new technologies (technology driven). Consumers will choose the product specifications or standards that meet their individual needs. This process also occurs in the production activities of a company. In business activities, there is a terminology of internal customer; this sense refers to the business activities that can be grouped into several sub-activities. The next activity or sub activity can be regarded as customers for the previous activity. Therefore, the tools or language to communicate in business activities are the industrial standards and the national or international standards.

Having looked at the strategic issues related to the role of standards in business activities and the findings from several researches that show the contribution of standards [1], [3], [4], [5], [7] and [8], since 2009, the ISO as one of the Standards Development Organizations (SDOs) has made the initiative to develop a methodology to measure the economic benefits of standards. Benefits in the methodology are defined as the economic benefits of the application of the official standards developed by the SDO. The approach is used to assess the benefits of standards, as can be seen in Figure 1.

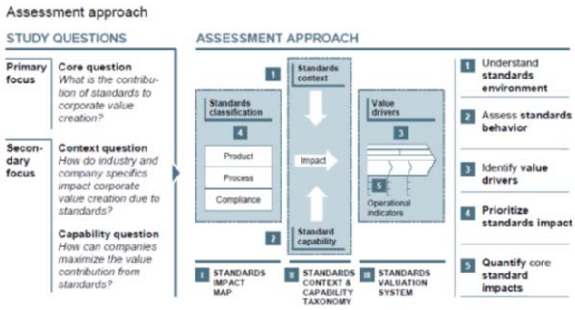


Figure 1. ISO Methodology Approach to Assess the Economic Benefits of Standards [6].

According to the methodology, there are three factors that influence the emergence of benefits through the value creation process of the application of standards in business organizations. The first factor is the standards context. It looks at influences from the outside of the business organization such as how to position the business organization in the industrial value chain, how the power within the industry is managed, how close the relationship between business and standards and the market novelty of business organizations is. The second factor is the ability of companies to implement the standards. Three aspects that should be considered for this factor are; the first is the level of competence acquired by a company in relations to standards in general, which may include formal organizational structure and the availability of experienced professionals in the field of the standards. The second is the ability to implement standards, including supporting measures such as good engineering practices or technical infrastructure (e.g. information technology (IT) systems and applications). The third aspect is the company's attitude toward the standards. There are two points here, the company could consider them irrelevant and take a reactive approach, or they think strategically and take a proactive approach to monitoring the implementation and management standards [6]. The third factor is the role of standards for business organizations. There are three levels for the factor, namely: strategic shaping standards, strategic adoption standards, and operational standards adoption.

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Standards capability is to see how the internal conditions of companies relate with the operational capability to implement standards. On the other hand, how the companies respond to the new standards issues should also be known. How business organizations respond to the issue of new standards will show how well the company's internal capabilities related with the standards are. There are two types of response, namely reactive and proactive. Companies that behave by just waiting for the emergence of new standards and are not involved in participating and influencing the issue of developing new standards can be categorized in the type of reactive respond. Such companies are usually those with weak Research and Development (R and D) sections or those where the technology products and processes are derived from the parent company, so the standard issues with regard to strategic activities are handled by the parent company. On the other hand, companies with proactive response are actively involved in developing and influencing the emergence of a new standard in their field of business. Companies in this category typically have strong R and D sections. The general character of companies in Indonesia is weak in R and D. That is why the response characteristic to standards issues is reactive.

Based on the explanation of the standards capability and response to standards issues, industry characteristics related with standards implementation can then be mapped in four quadrants. The first quadrant is called the ignorant. In the sense that the company's internal capability to implement standard is low or weak and the respond is reactive. The second quadrant is categorized the seeker. Companies with this type tend to be proactive but their capabilities of implementing standards are low or weak. The third quadrant is the follower. Companies with this type have strong standards capabilities and reactive responses. The fourth is the leader, in which the R and D capability is strong. Companies in this quadrant also participate actively to develop and to influence the emergence of new standards, and have strong standards capabilities as their hallmark.

The study maps two companies based on the standards capability and the response to standards issues. Qualitative facts were used to infer the response to standards issues and both qualitative and quantitative facts were used to infer the standards capability.

## II. METHODOLOGY

This study uses a mixed method approach in two units of analysis (firm). A mixed method is an approach that emphasizes a combination of methods, a philosophy, and a research design orientation [2]. In this study, we used the Convergent Parallel Design. The model is one of six models for the mixed method design. The model uses qualitative and quantitative approaches to data collection and analysis in parallel process and then conducts a joint interpretation of qualitative and quantitative findings [2].

The study was conducted in three stages. First, the objects of multiple case studies were selected on May 2011. The data collection was done using in-depth discussion, observation, company data records and document study related with the experience of standards implementation, and questionnaires on August until November 2011. The data processing and analysis were done on December until April 2012.

The study objects are two manufacturing companies in diesel engine assembly and steel material processing in Central Java Province - Indonesia, which will be called "Dodo" and "Soso" respectively for the purpose of anonymity. Outstanding companies from Japan are the main shareholders of the case study objects. Additionally, Japan technology in the production process is implemented in almost all of the business activities.

## III. RESULTS

This section is divided into three sub sections to discuss the findings. First, the qualitative findings are discussed. Second, the results of the quantitative findings are shown, and the third, the mapping on Standards Capabilities and Responses to Standards Issues of the two cases are explained.

### *A. Qualitative findings*

The organizational structure in Dodo has been updated according to standards development. Previously there were four departments, but now there are six departments at Dodo. Each of the departments already has job descriptions and standards operating procedures. In addition, now, there is a special section to deal with problems in implementing ISO 9001 known as the management representative. The section supervises and controls all activities of the departments based on reports related with standards implementation. Dodo has been running the procedures in 9001 and ISO 14001, such as the management has conducted the process of documentation of all activities being undertaken. The management conducts evaluation to the implementation of standards. It is stated that every element of the company including the employees is required to have work targets, and the progress is evaluated every three months.

Funds are also allocated to support the achievement of targets for each employee or department, and also to attend seminars or training either inside or outside the company related standards. ISO also requires companies to interact with the surrounding communities. So, there are several activities related with the corporate social responsibility program. Dodo has received ISO 14001:2008 certification of environmental management, and the company allocates funds for liquid and solid waste treatment. The Company also provides specialized training for employees or new operators to be able to adapt to work in line with the standards implementation. The Company also uses certified production machines and in addition, the person who inspects the raw materials and the final products is a person who has received official certification from a reputable organization.

Dodo's response to new standards issues has tended to be reactive, although they always monitor the issue of

new standards to be applied. The strategic role of standards developed by SDOs is mostly done by the parent company or the main shareholder. Dodo develops standards to improve internal business processes that are usually based on ideas from the employees, company experience and best practices of company daily activities. These efforts are to improve the effectiveness and efficiency of the production process. Further discussion of this section will be the results in Soso.

Soso has made efforts to monitor the process of standards implementation, and to set specific targets to be achieved by the company. As in the production department, for example, a target to be achieved is to make energy savings of electricity used during the production process. In addition to the production department, the maintenance department has also set a target to reduce the production machine breakdown. The target is the length of breakdown (in percentage) in one month period. At first, Soso's management set a target of 1% on the 1st and 2nd Mill machines. After it was implemented in 2008, it showed that the percentage of breakdown on Mill 1 was 0.9% and on Mill 2 was 1.3%. This means that the target was not achieved. Then, Soso evaluated the targets, the standards and technology that were implemented in 2008, and finally improvement could be achieved. This example shows a continuous improvement process through standards in Soso.

The allocation of funds to the standards in Soso is implemented in various ways such as funds for employee self-improvement, including funds for both internal and external trainings. Training is done on a regular basis, i.e. every month with training materials depending on the needs of the company. Allocated funds are also used for standards audit process, which is conducted once per year by internal and external auditors. Allocation of other funds, namely the treatment of waste generated from the production process. Waste generated by Soso is basically grouped into two categories, namely its own cultivable waste and the untreatable waste.

The effectiveness of standards implementation is also influenced by the capability of the companies to implement the standards. The indicators of this capability include: the organizational structure that supports the application of standards, the availability of the technology that is in accordance with the standards, the availability of skilled employees, and the availability of information systems. Since a few years ago, Soso has felt the need to manage standards, so it then formed a new organization structure, in which the addition of new department, namely the Document Control department was introduced. The department is specifically tasked to handle all kinds of documentation related with standards that the company needs.

Meanwhile, related with the example on the application of standards in Soso and the contributing factors mentioned previously, the SNI (Indonesia National Standards) 05-0119-2000 has stated that the pipe have several criteria as requirement. To perform the test, it takes a specific machine, so the company bought the machine or technology to support the implementation of SNI in the company. Another important factor is the existence of expert employees in Soso who supports the standards implementation. Skilled employees are those who have knowledge and experience about the standards. Accordingly, the information systems which include systems of sales, purchasing, documentation and other aspects are also important. With regards to the company response to the issues of new standards, in general, it takes a reactive stance. This is evidenced by the limited powers possessed by the company to respond to the issue of new standards. The authority for the implementation of new standards is taken more by the main shareholders (two companies from Japan).

*B. Quantitative findings*

Based on the understanding of the dimensions of capability in the ISO standards methodology, questions in the questionnaire to confirm the standards capability perceptions were developed. Standards capability perception consists of three indicators and 13 questions. There are 11 questions in the dimension of the level of competence which includes two indicators. The first indicator is company's response to standards through the changes and adjustments to the structure of organization. The second indicator is the experience on the application of standards and the involvement in the development of standards. The dimension of ability in implementing standards involves six questions related with the company's policy in the use of technology to support the implementation of standards, human resource development and the use of information systems in the company. The third dimension is the company's attitude towards standards consisting of nine indicators and 25 questions. The respondents are employee in top management, middle management, operational level workers and all departments in each company. The purposive sampling was applied to choose respondents.

The sample size in Dodo and Soso is 106 respondents. Second orders confirmatory analysis was carried out using Smart PLS and several testing were conducted to evaluate standards capability perception model. The first testing is Convergent Validity. It suggests that a indicator to be reliable should have a Factor Loading value more than 0.50. Results of the convergent validity testing show that the value of factor loading for all indicators are more than 0.50 so the measurement model is convergent validity. Based on the discriminant validity test results, the value of cross loading is higher than other construct so it means that the high discriminant validity of model is high. The value of AVE can also measure discriminant validity. First order construct will have high discriminant validity if value of AVE is more than 0.5. The next testing is composite reliability. The composite reliability value is more than 0.7.

TABLE 1. RESULTS OF DISCRIMINANT VALIDITY USING AVE VALUE AND COMPOSITE RELIABILITY (CR) TESTING

| Dimension | AVE | CR | **Conclusion** |
|---|---|---|---|
| *Level of competence* | 0.600518 | 0.820108 | Valid and Reliable |
| *Ability in implementing standards* | 0.528088 | 0.879069 | Valid and Reliable |
| *Company's attitudes towards standards* | 0.724615 | 0.795783 | Valid and Reliable |
| *Standards capability* | 0.623821 | 0.846599 | Valid and Reliable |

The next testing are correlations of first order construct with second order construct and inner model between second orders construct can be seen from value T statistics. The value of T statistic is more than 1.96 for significant level ($\alpha = 0.05$). Based on result of testing, it can be concluded that the first order construct influence second orders construct, and three dimensions significantly influence standards capability. Final calculation is to determine the contribution of all constructs (dimensions) to standards capability. It can be measured by R Square value. Based on output of smart PLS, the value of R Square is 0.8480. It means that the contribution of all constructs is 84.80 % and 15.2% by others. After passing the validity and reliability tests of the second orders confirmatory analysis model, the next stage is the measurement and calculation of the standards capability scores.

Scores have been obtained by calculating the average of several items for each dimension statement that has been filled by the 75 respondents for Dodo and 60 respondents for Soso. It is assumed that the weight of dimensions (constructs) of standards capability is the same with contribution of constructs in output of smartPLS. The results of the calculation are as follows.

TABEL 2. STANDARDS CAPABILITY SCORES

| **Dimensions** | **Score** | |
|---|---|---|
| | **Dodo** | **Soso** |
| *Level of competence* | 1.8928 | 1.8345 |
| *Ability in implementing standards* | 0.9363 | 0.9279 |
| *Company's attitudes towards standards* | 1.7002 | 1.6286 |
| *Cumulative scores for Standards Capability* | **4.5293** | **4.3910** |

Based on qualitative and quantitative findings, then the mapping on standards capability and response to standards issue can be seen in Figure 2.

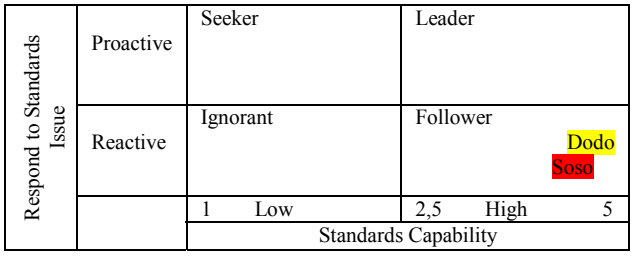


Figure 2. Mapping on Standards Capability and Response to Standards Issue

## IV. DISCUSSION

Based on the findings in the previous section, it can be said that Dodo is a follower with the standards capability score of 4.51 and the response to standards issues is reactive. Standards capability score is obtained from the average score of the three dimensions ranging from 4.4 to 4.6. The narrow interval of the scores in all three dimensions indicates that the applications of standards in Dodo have been deeply and uniformly understood at all levels and departments. Dodo realizes that in order to produce high quality products, it would require the participation of all management functions in the enterprise and the participation of all employees engaged in production and management of the company. Many activities have been carried out by Dodo to achieve these objectives, including facilitating a variety of trainings for operators and the staff, and evaluating the overall performance on a monthly basis. Therefore the previous less work performance can be improved significantly.

According to the interviews conducted by the researchers, since the implementation of ISO 9001, the company has achieved positive changes. The changes are internal and external in nature, which in turn will impact on improving product quality and increasing the competitiveness of the products. Internal benefits are the perceived benefits and can be seen in the scope of internal organization. Meanwhile, external benefits are those associated with the factors outside the organization. The existence of the standards process has influenced the company internally, while the standards of product will have more influence on meeting the needs of the consumers.

The Soso findings also indicate that the company is a follower. Based on the results of data processing in Soso questionnaire about the perceptions on the standards capability of the company, it can be depicted that the employees have a high perception for all dimensions of the standards capability in the range of 4.3 to 4.4 out of 5. Indicators that are measured in the questionnaire are as follows: the monitoring of the implementation of standards in the company, the allocation of sufficient funds for the implementation of standards such as employee self-improvement and maintenance of the standard-based certifications , the process of documenting the company's activities, the standards renewal process, the process of auditing standards, the purchase of support facilities, the waste management, and the facility provided by the employees associated with implementing the standards.

Although many attempts have been made by the company to support the implementation of standards, in fact there are still employees in Soso who are still lack of awareness in following the implementation of existing standards in the company. For example, ignoring to record the production process in one day makes the unavailability of the labeling information needed. This will have a negative impact if an error occurs in the

products in the sense that the cause cannot be traced because of incomplete product information.

## V. CONCLUSION

Based on the results and discussion sections, the conclusion is twofold. First, standards have widely and systematically implemented for all departments and all levels of the two companies. It shows that the companies have understood the contribution of standards in the process of value creation. The parent company in each unit of analysis has the dominant role of the decision related with the use and development of standards, so that Dodo and Soso are more reactive than proactive over the issues of new standards. On the other hand, the scores on standards capability of both companies are high, which show the companies' long experience and technology transfer from the parent companies have made the companies understand the contribution of standards in the process of value creation. Second, based on the facts related with the response to standards issues and the standards capability of the companies, it can be concluded that both Dodo and Soso are in the category of follower.

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