COMMERCIALIZATION OF CONCRETE AND CONSTRUCTION LABORATORY WITH ISO 17025:2017 ACCREDITATION

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Abstract

Nowadays, internationally recognized test results of construction materials are critical for companies handling government projects in the construction sector. A university's Concrete and Construction Laboratory sees commercialization as a way to expand its capacity and usage to this potential market. The standardization strategy employed in this research is to implement and obtain ISO 17025:2017 accreditation. Preparation of required documents is carried out as the first step in preparing for accreditation. Preparation is done by identifying document requirements, identifying business processes, identifying document completeness using a checklist, analyzing document completeness, and generating conclusions. The results of the identification and analysis of the completeness of the documents using the checklist show that the documents that need to be made by this University's Concrete and Construction Laboratory are as many as 70 documents and the four documents that have been owned need to be adjusted according to the requirements of ISO 17025:2017.

Keywords: commercialization, standardization, document completeness, testing laboratory, ISO 17025:2017

1. Introduction

The construction sector is becoming increasingly competitive. Construction projects, particularly government projects, are now regarded on an international scale rather than only on a national basis. Companies that work on government projects must test their products to ensure their quality, which necessitates the use of test equipment that can produce globally accepted test results. A university's Concrete and Construction Laboratory, which has test equipment and can conduct tests, sees commercialization as a way to expand its capacity and usage. The intention of commercialization is to advertise the laboratory's services both nationally and internationally, therefore it's not just for educational purposes. Several services, such as concrete compression test, concrete flexural test, and steel tensile test, can be marketed based on the market potential of this University's Concrete and Construction Laboratory. Standardization is one of the strategies for entering and expanding the market both domestically and globally (Viswanathan & Dickson, 2007; Erdoğmuş, et al., 2010; Chung, et al., 2012). Standardization is the process of planning, formulating, establishing, implementing, enforcing, maintaining, and supervising the implementation of standards in an orderly manner and in collaboration with all stakeholders, according to the Law of the Republic of Indonesia Number 20 of 2014 on Standardization and Conformity Assessment. The function of standardization is also capable of improving product quality, allowing products to have outstanding commercialization and raise product competitiveness (Prasetyo, 2017), where the products and services offered in this study are in the form of test results.

Standardization for testing laboratories can be accomplished by implementing and acquiring ISO 17025:2017 accreditation. ISO standards are designed to make products and services better and to make companies, governments and other organizations more efficient (Weedmark, 2019). ISO 17025:2017 is general requirements for the competence of testing and calibration laboratories (ISO, 2017). ISO 17025 regulates the laboratory quality management system (QMS) which is a documented procedure applied by organizations to satisfy consumer needs (Praptomo, 2018). Documentation is essential to quality and process control (Atlassian, 2022). In the case of the laboratories accredited by the ISO 17025 standard, the organizational benefits are the possibility of traceability of all the work performed and of all the equipment, and also the operational definition of the laboratory, which means that the results are reliable and credible. (Barradas & Sampaio, 2017). ISO 17025 also facilitates collaboration between laboratories and other organizations by boosting cross-national acceptance of results (ISO, 2017), hence increasing competitiveness. To obtain ISO 17025:2017 accreditation, the Concrete and Construction Laboratory must first prepare the required documents, which must be designed in accordance

with ISO 17025:2017 standard. The purpose of this research is to prepare document requirements by determining the number of documents that must be created and adjusted by a University's Concrete and Construction Laboratory in accordance with ISO 17025:2017.

2. Method

The research method is used to see the description of the steps of the research carried out. This study's research method consists of five steps. The flow chart in Fig. 1 depicts the research method.

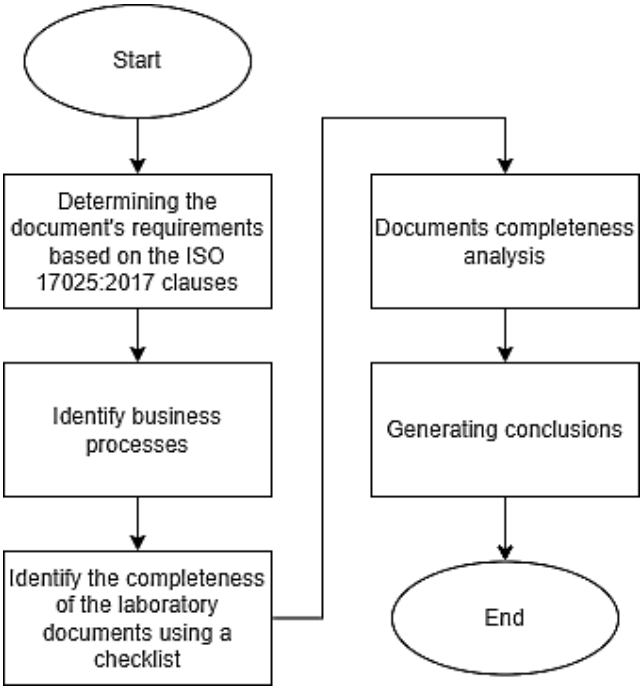

Figure 1. Flow chart of research method

The first step is determining the document's requirements based on the ISO 17025:2017 clauses. This step is done by conducting literacy on the ISO 17025:2017 standards to determine the number of documents that must be documented (Faridah, et al., 2018). The second step is to identify business processes at one of the University's Concrete and Construction Laboratory in order to determine all of the operations that occur in the laboratory. The third step is to identify the completeness of the laboratory documents. A checklist is used to determine the quantity of documents possessed by the Concrete and Construction Laboratory for each clause. Checklists provide guidance for the collection of relevant evidence used to determine the merit, worth, or significance of an evaluand (Martz, 2010). After the identification of the document's completeness has been done, the fourth step is to analyze its completeness. The Concrete and Construction Laboratory performs document completeness analysis by analyzing the checklist results to determine the number of documents that need to be created and adjustments that need to be made. The last step involves generating conclusions based on the findings of this research and providing recommendations for further research.

3. Results and Discussion

According to (Faridah, et al., 2018) ISO 17025:2017 requirements consist of 8 clauses. The first to third clauses are an introduction to ISO 17025:2017. The first clause discusses the scope. The second clause discusses normative references. The third clause discusses terms and definitions. The fourth to eighth clauses are clauses that must be applied to the laboratory management system. The fourth clause discusses general requirements. It consists of two sub-clauses which are impartiality and confidentiality. The fifth clause discusses structural requirements. The sixth clause discusses source requirements. It has six sub-clauses which are general, personnel, facilities and environmental conditions, equipment, metrological traceability, and externally provided

products and services. The seventh clause discusses process requirements. It consists of eleven sub-clauses which are review of requests, tenders and contracts, selection, verification and validation of methods, sampling, handling of test or calibration items, technical records, valuation of measurement uncertainty, ensuring the validity of results, reporting of results, complaints, nonconforming work, control of data and information management. The eighth clause discusses management system requirements. It has nine sub-clauses which are option, management system documentation, control of management system documents, control of records, actions to address risks and opportunities, improvement, corrective actions, internal audits, and management reviews. clause 4, 5, and 8 focused on management requirements

Determination of the name and number of documents is carried out at this step by literacy to the requirements of ISO 17025:2017. The documents format in ISO 17025:2017 consist of four levels of documents, namely quality manuals, quality procedures, work instructions, and forms or records (Labmutu, 2022). A quality manual is a document that contains information that guides the implementation of a quality management system for the company's top management level (Director, CEO, etc.) and management levels below it (Efansyah & Nugraha, 2019). Standard operating procedures are documented processes that incorporate stages to attain the intended goals or process outputs (Abuhav, 2017). Work instructions are the actions performed by a worker to do work safely and completely (BPM, 2019).

The results of determining the document's requirements based on the ISO 17025:2017 clauses can be seen on Table 1. The number of documents required for clause 4 is three documents. The number of documents required for clause 5 is three documents. The number of documents required for clause 6 is 31 documents. The number of documents required for clause 7 is 29 documents. The number of documents required for clause 8 is eight documents. Therefore, the total number of documents that are required to be owned by the Concrete and Construction Laboratory is 74 documents.

Table 5. Number of Documents Required for Each Clauses

Clause	**Number of Documents Required**
4	3
5	3
6	31
7	29
8	8
Total	74

The flow of acceptance testing processes in the laboratory may be described as a business process. The business process is a series of activities carried out by the company to achieve the goal, namely the product or service it produces (Mahatmavidya, 2021). The business process demonstrates how all entities engaged in the laboratory conduct their operations, beginning with incoming orders and ending with the client receiving the test report findings. A business process is a set of operations designed to systematize and increase understanding of an activity inside a company. The business process governs the order of actions in order for them to be well-organized. Business processes must be scalable and organized in order to provide valuable results (Bandiyono, 2017).

Customer orders initiate the business process, which is subsequently accepted by the laboratory assistant, who is in charge of administration and finances. Laboratory assistants handle financial reports, which are then reviewed by the laboratory's head. The process is continued with the laboratory helpers storing the specimen after obtaining the specimen from the client through the laboratory assistant. The process is then continued with the laboratory helpers conducting tests, the findings of which are submitted to the laboratory assistant to be processed into a test report, and the laboratory helpers storing the specimens that have been tested. The head of

the laboratory must first verify the test report once it has been processed before the laboratory assistant sends it to the client. If the test report is appropriate, the results can be submitted to the client until customer satisfaction is achieved.

Table 6. Throughout the business process, the laboratory head must also supervise the work of laboratory assistants and laboratory helpers. Likewise, laboratory helpers who are in charge of the laboratory. The laboratory also has support in its work, especially the head of the study program and the secretary of the study program. The study program's head is in charge of authorizing internal transactions, while the study program's secretary manages routine laboratory budget spending. The results from identifying the completeness of the laboratory documents are created in the form of a checklist. The example of document completeness checklist can be seen through Table 2.

Table 7. Example of Document Completeness Checklist

Clause		No	Document Name	Have / Not Have
4 General Requirements		1	Impartiality Commitment	X
		2	Confidentiality Commitment	X
		3	Integrity Pact	X
5 Structural Requirements		1	Testing Scope	X
		2	Organization Structure	V
		3	Responsibilities, authority, and job descriptions	X
8 Management System Requirements	8.2	1	Quality Policies	X
		2	Quality Goals	X
	8.3	1	Document Control Procedures	X
	8.4	1	Record Control Procedures	X
	8.7	1	Records of non-conformances, causes and actions taken, and results of corrective actions	X
	8.8	1	Records of evidence of audit program implementation and audit results	X
	8.9	1	Management review input record	X
		2	Management review output record	X

Clauses 4, 5, and 8 are examples of document completeness identification. Clause 4 is a general requirements clause. The clause 4 document contains three sorts of documents: impartiality commitment, confidentiality commitment, and integrity pact. All three documents address compliance with sub-clauses on impartiality and confidentiality. Clause 5 is about structural requirements. The clause 5 document consists of three sorts of documents: the testing scope, organizational structure, and responsibilities, authority, and job or task descriptions. Clause 8 is about management system requirements. The clause 8 document consists of eight sorts of documents: quality policies, quality goals, document control procedures, record control procedures, records of non-conformances, causes and actions taken, and results of corrective actions, records of evidence of audit program implementation and audit results, management review input record, and management review output record.

Table 8. According to the example of the checklist, none of the clause 4 documents have been fulfilled or owned by the laboratory. The laboratory also has not prepared or owns the documents listed in clause 8. The checklist also shows that just one document in clause 5 is fulfilled or owned by the laboratory. The identification of document completeness from clauses 4, 5, and 8 indicates that the document is still incomplete. This University's Concrete and Construction Laboratory has failed to comply with the documentation in clause 4 and only has the organizational structure document in clause 5. Overall, there are still many documents that are not yet available and do not comply with the requirements of ISO 17025:2017.

Table 9. Results of Document Completeness Analysis

Clause	Number of Documents Required	Number of Documents Owned	Number of Documents that Required to be Created	Number of Documents that Required to be adjusted
4	3	0	3	0
5	3	1	2	1
6	31	0	31	0
7	29	3	26	3
8	8	0	8	0
Total	**74**	**4**	**70**	**4**

According on the findings of the document completeness analysis, 74 documents are required. This University's Concrete and Construction Laboratory currently contains four documents as follows: organizational structure, procedure for receiving specimens, test forms, and test results reports. This University's Concrete and Construction Laboratory does not have documents for clauses 4, 6, and 8. There is just one document in clause 5 that this University's Concrete and Construction Laboratory owns. This University's Concrete and Construction Laboratory owns just three of the documents listed in clause 7. Because they do not meet the standards of ISO 17025:2017, the four documents owned by this University's Concrete and Construction Laboratory must be revised.

Table 10. Based on the results, the number of documents that must be created is as many as 70 documents. In percentage, this University’s Concrete and Construction Laboratory document completeness that has not been fulfilled is as many as 91,26%. The number of documents that are required to be created in clause 4 is three documents. The number of documents that are required to be created in clause 5 is two documents. The number of documents that are required to be created in clause 6 is 31 documents. The number of documents that are required to be created in clause 7 is 26 documents. The number of documents that are required to be created in clause 8 is eight documents. This indicates that this University’s Concrete and Construction Laboratory is still

not ready in terms of document completeness to fulfill ISO 17025:2017, thus documents must be created and adjusted quickly. Because the document creation process is still ongoing, it is not reported in this paper.

4. Conclusion

Preparation of required documents is the first step to obtaining ISO 17025:2017 accreditation, in order to increase the competitiveness and competence of this University's Concrete and Construction Laboratory, also in order to successfully commercialize it. The documents needed by this University's Concrete and Construction Laboratory for the requirements of ISO 17025:2017 are 74 documents ranging from clause 4 to clause 8. There are four documents that need to be adjusted according to the requirements of ISO 17025:2017 by this University's Concrete and Construction Laboratory. The number of documents that are required to be created is as many as 70 documents or 91,26% in percentage. The number of documents that are required to be created from clause 4 to clause 8 in a row is three, two, 31, 26, and eight. This indicates that this University's Concrete and Construction Laboratory is still not ready in terms of document completeness to fulfill ISO 17025:2017. Through the preparation of this required document, it is hoped that this one of the University's Concrete and Construction Laboratory can design and implement the document in order to obtain ISO 17025:2017 accreditation to improve and guarantee the quality of the laboratory, as well as commercialize its laboratory.

5. Acknowledgement

We would like to acknowledge and thank the Industrial Engineering Study Program at Petra Christian University in Surabaya for providing us with the opportunity and assistance to accomplish this research.

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