

# **Designing Nonconforming Services (NCS) Control System for ISO 9001 Implementation**

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## **Abstract**

ISO 9001 is a popular topic in quality management research field. Many researchers have studied ISO 9001 implementation in various sectors. However, there is lack of ISO 9001 study that focus on the content of ISO 9001 requirement. More specifically, there is lack of literature that discussed nonconforming services (NCS) control system in ISO 9001 implementation. On other side, controlling nonconforming outputs is one of ISO 9001:2015 requirements. In order to fill the gap in the literature, this research aims to design NCS control system for ISO 9001 implementation in a service company. The NCS that is controlled is all non-conforming outputs at all stages of service provision. This research applied qualitative research methodology by using case study approach. The object of case study is a company that provides laundry service. When the research is performed, the company was under process in implementing ISO 9001:2015. This research consists of four stages, namely setting process objectives and scope, data collection and existing NCS control system mapping, process analysis, and NCS control system formulation. The research result shows the NCS control system we developed for the research object. This paper will describe the content of the system and the research implications.

## **Keywords**

ISO 9001, Nonconforming, System, Output, Services

## **1. Introduction**

### **1.1 Research Background**

It is well known in existing literature that focus on quality is a critical success factor for a company (Sumaedi and Yarmen, 2015; Clemes et al., 2008). Many researchers have revealed the importance role of quality. For example, in service contexts, Lai and Chen (2011) found that customer perceived service quality has a positive impact on customer perceived value and satisfaction. In addition, service quality has been proven to have a positive effect on customer loyalty (e.g. Leninkumar, 2016; Jasinskas et al., 2016).

In order to focus on quality, a company can implement ISO 9001. ISO 9001 is an international standard that provides a framework for developing quality management system. According to van den Heuvel (2006), the standard consists of good quality management practices that aim to ensure organization fulfilling customer and regulation requirements, achieving customer satisfaction, and continually improving its product and system.

Many organizations have adopted ISO 9001 as their quality management system framework. According to ISO survey, in 2016, there are 1,106, 356 organizations around the world have certified their quality management system according to ISO 9001 (ISO, 2017). This figure indicated an increase of 7% on 2015 (ISO, 2017). Sampaio et al. (2009) reviewed empirical researches on ISO 9001 implementation and they explained that ISO 9001 can provide many benefits for organization. Sampaio et al. (2009) categorized the benefits into two types of benefits, namely external benefit and internal benefit. The external benefits include access to new markets, corporate image improvement, market share improvement, ISO 9000 certification as a marketing tool, customer relationship improvements, customer satisfaction, and customer communication improvements while the internal benefits include productivity improvements, product defect rate decreases, quality awareness improvements, definition of the personnel responsibilities and obligations, delivery times improvements, internal organization improvements, nonconformities decreases, customers' complaints decreases, internal communication improvements, product quality improvement, competitive advantage improvement, and personnel motivation (Sampaio et al., 2009).

Although many researchers have found the positive impact of ISO 9001 implementation, there are some researchers that didn't obtain similar results. Martinez-Costa & Martinez-Lorente (2007) found that ISO 9001 certification didn't improve organization performance. They also found that non ISO 9001-certified organization have better performance than the ISO 9001-certified organization. Sampaio et al. (2011) have also found that the performance of non ISO 9001-certified organization is better than the ISO 9001-certified organization ones. Thus, it is still important to study ISO 9001 implementation in order to improve its effectiveness.

### **1.2 Previous Researches and Research Gap**

ISO 9001 is a popular topic in quality management research field. Many researchers have studied ISO 9001 implementation in various sectors. Furthermore, some researchers have also reviewed those researches and performed state of the art study, such as Sampaio et al. (2009), Psomas and Fotopoulos (2009), Rakhmawati et al. (2014), etc.

Even though many researches on ISO 9001 implementation have been performed, the researchers generally focus on the motivation of organization in implementing ISO 9001 (e.g. Djofack and Camacho, 2017; Chu et al., 2001; Zaramdini, 2007), the benefits of ISO 9001 implementation (e.g. Gotzamani et al., 2007; Staines, 2000; Zaramdini, 2007, Santos and Escanciano, 2002) or the impact of ISO 9001 implementation on certain performance indicators (e.g. Aarts and Vos, 2001; Benner and Veloso, 2008; Feng et al., 2008; Singels et al., 2001; Nicolau and Sellers, 2002), and the barrier of ISO 9001 implementation (e.g. Zeng, Tian, and Tam, 2007; Abu-Khadra et al., 2012, Jayasundara and Rajini, 2014; Gopal and Attri, 2017). Some researchers have also investigated the process of ISO 9001 implementation (e.g. Garcia et al., 2013; Motwani et al., 1996). However, as far as researcher knows, there is lack of ISO 9001 study that focus on the content of ISO 9001 requirement.

According to van den Heuvel (2006), ISO 9001 contains good quality management practices. However, the standard is only providing "the essential elements of a proper quality [management] system, without recommending the ways to apply them" (Tsiotras and Gotzamani, 1996 cited in Magd, Kadasah, and Cury, 2003). For example, the standard

requires organization to develop quality policy and quality objectives (ISO, 2015). However, the standard doesn't show the ways to develop quality policy and quality objectives as well as the content of quality policy and quality objectives. The organization that implements ISO 9001 has a freedom to set up its own system in developing quality policy and quality objectives. This condition leads ISO 9001 requirement can be implemented using different ways by different organizations. Sumaedi and Rakhmawati (2015) stated that there are two types of quality management system design for implementing ISO 9001, namely procedural approach and process approach design type. Furthermore, they also stated that the different type of quality management system design will cause different outcome of ISO 9001 implementation. Therefore, studying the content of ISO 9001 requirement is interesting and important.

One of ISO 9001 requirement is controlling the nonconforming outputs. The latest version of ISO 9001 (ISO 9001:2015) regulates the requirement on the sub clause of 8.7 control of nonconforming outputs. According to ISO 9002 (2016), the intent of this sub clause is "to prevent unintended delivery or use of non-conforming outputs (at all stages of production and service provision)" (ISO, 2016). Given this, we can conclude that this sub clause is applied only on the product realization process. In ISO 9001:2008, the sub clause was entitled as "control of nonconforming product". Hoyle (2009) explained that "although in principle a product is a result of a process, and nonconformity control applies to all processes, the products that are intended to be subject of Clause 8.3 [control of nonconforming product] are destined for delivery to a customer". Thus, in the context of service industries, the sub clause is applied for output at all stages of service provision. On other words, the sub clause requires service companies to design and implement nonconforming services (NCS) control system.

The proper implementation of NCS control system can prevent customer from obtaining service defect. Furthermore, it may also minimize the probability of customer complaint after they receive the service. Given this, it is important to study NCS control system in order to improve ISO 9001 effectiveness in service industries. Unfortunately, up to date, there is lack of literature that discussed NCS control system in ISO 9001 implementation.

### **1.3 Research Objectives**

In order to fulfill the gap in the literature, this research aims to design nonconforming services (NCS) control system for ISO 9001 implementation in a service company. The NCS that is controlled is all non-conforming outputs at all stages of service provision.

The remainder of this paper is organized as follows. The first section reviews the theoretical background of ISO 9001 and NCS. The second section presents the research methodology. The third section describes the results of the research. The fourth section presents the theoretical and managerial implications. The final section is the conclusion of this paper.

## **2. Literature Review**

### **2.1 ISO 9001**

ISO 9001, an international standard that is issued by ISO, was first published in 1987 and revised subsequently in 1994, 2000, 2008, and 2015. ISO 9001:2015 "specifies requirement for a quality management system when an organization: a) needs to demonstrate its ability to consistently provide product and service that meets customer and applicable statutory and regulatory requirements, and b) aims to enhance customer satisfaction through the effective application of the system, including processes for improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements" (ISO, 2015).

ISO 9001:2015 applied the Plan-Do-Check-Act (PDCA) cycle and risk-based thinking (ISO, 2015). Furthermore, the standard was developed based on seven quality management principles, namely customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making, and relationship management (ISO, 2015).

ISO 9001:2015 consists of ten clauses. However, the requirements that should be fulfilled by organization if they want to ISO 9001 certified are stated in clause four to ten. On other words, there are only seven main clauses of

quality management system requirements according to ISO 9001. The first clause is context of organization. This clause requires organization to understand the context of organization, its interested parties needs and expectation, determining quality management system scope and processes. The second clause is leadership. The clause describes the roles and responsibility of the top management of organization in ISO 9001 implementation. The third clause is planning. This clause requires organization to address risk and opportunities, developing quality objectives and planning to achieve them, and planning the changes. The fourth clause is resources. This clause describes quality management system requirements regarding the arrangement of the resources that are needed for implementing ISO 9001. The resources include people, infrastructure, environments, monitoring and measuring resources, organizational knowledge, and documented information. The fifth clause is operation. Briefly, the clause describes quality management system requirements regarding operation and design and development activities. The sixth clause is performance evaluation. This clause describes the activities that should be performed by organization in order to check the system and its performance. It includes monitoring, measurement, analysis, and evaluation, internal audit, and management review. The seventh clause is improvement. This clause describes the activities related with the necessity for nonconformity, corrective action, and continual improvement.

## **2.2 Nonconforming Services**

Control of nonconforming output is one of ISO 9001:2015 requirement. As previously explained, this requirement is applied to all stages of service provision or in product realization process. ISO 9000 (2015) defines nonconformity as “non-fulfillment of a requirement” while output as “the result of a process”. On other words, nonconforming service is the result of a process in a stage of service provision or in product realization process that doesn’t fulfill a requirement.

Hoyle (2009) explained that nonconforming product is “product that does not conform to agreed product requirements when subject to either planned or unplanned verification”. Hoyle (2009) stated that there are five types of requirements, namely specified customer requirements, intended usage requirements, stated or implied needs, organization’s own requirements, and customer expectation. Thus, based on Hoyle (2009), nonconforming services is service that does not conform to agreed service requirement which comes from customer, organization or others.

Referring to previous explanations, we can conclude that nonconforming services relate with the defect of output that happens during the preparation of service or during the service provision. The defect itself shows the discrepancy between the actual output with the agreed output requirements that may come from customer, organization, or others.

ISO 9001 (2015) requires organization to control nonconforming output in clause 8.7. Thus, in the context of service industries, this means organization needs to control nonconforming service. According to ISO 9002 (2016), the intent of this sub clause is “to prevent unintended delivery or use of non-conforming outputs (at all stages of production and service provision)”. Furthermore, control of nonconforming output may reduce cost of poor quality (Feigenbaum, 1951 cited in Chiarini, 2015).

Table 1. ISO 9001:2015 requirements regarding nonconforming services

No	Aspect	Requirement
1	Action	There is action to eliminate NCS The action may one or more of the following ways: <ul style="list-style-type: none"> <li>• Correction</li> <li>• Segregation, containment, return or suspension of provision of products and services</li> <li>• Informing the customer</li> <li>• Obtaining authorization for acceptance under concession</li> </ul>
2	Document	Contains the nonconformity, the action taken, any concessions obtained and the authority deciding the action on the nonconformity

Source: ISO (2015)

ISO 9001 (2015) describes some requirements regarding the control of nonconforming services. Generally, there are two main requirements. First, organizations need to take action on the nonconforming services. Second, organizations need to document the nonconforming services and the explanation regarding the action performed.

More specifically, table 1 shows the requirement of ISO 9001:2015 regarding control of the nonconforming services.

### **3. Research Methodology**

This research applied qualitative research methodology by using case study approach. The object of case study is a company that provides laundry service. When the research is performed, the company was under process in implementing ISO 9001:2015. The research stages can be seen in figure 1.

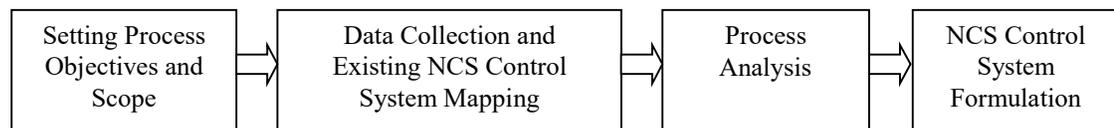


Figure 1. Research stages

#### **3.1 Setting Process Objectives and Scope**

Referring to ISO 9001:2015 clause 4.4.1, organization needs to determine the input, output, and the effectiveness criteria of quality management process. The effectiveness criteria can be defined as the process objectives while the input and output of the process can be defined as the process scope. Given this, in order to design nonconforming services (NCS) control system, we have to determine the NCS control process objectives and scope.

The process objective and scope development was performed by using discussion with the Director of the company. First, the researcher provided the draft of the process objectives and scope. Second, the discussion was conducted based on the draft.

#### **3.2 Data Collection and Existing NCS Control System Mapping**

Data collection and existing NCS control system mapping was performed by three ways. First, we conducted discussion with Director and General Manager of the company. Second, we performed unstructured interview with the head of production and his section heads. Third, we conduct observation.

The discussion and interview were performed informally and un-structurally. The information that we collected during the sessions are regarding the questions: what are nonconforming services that have happened in their services and how they dealt with them? Meanwhile, the observation we performed focuses on the instrument, document or infrastructure that they have for handling the nonconforming services.

#### **3.3 Process Analysis**

Based on the data we collected, process analysis was performed. The process analysis was aimed to diagnosis the gap between existing NCS control system with the ISO 9001:2015 requirement and to identify the opportunities for improvement in achieving the process objectives. The process analysis was performed by using thematic analysis. The theme of the process analysis can be seen in table 2.

#### **3.4 NCS Control System Formulation**

Based on the process analysis, we develop the NCS control system. To validate the system, we performed discussion with the Director and General Manager of the company regarding the system.

## 4. Results and Discussion

### 4.1 Setting Process Objectives and Scope

Based on the results of the discussion done with the Director, the NCS control process was design to control services that do not conform to company standards. More specifically, the process was built to prevent nonconforming services are delivered to customers. This process includes the finding of nonconforming services up to taking action to deal with such nonconforming services and reporting nonconforming services in management review meeting. The NCS that will be controlled is the nonconforming output that happens during the preparation of service or during the service provision. For example, the nonconforming output that may happen during the preparation of service is laundry material such as the availability and the specification of washing soap. The effectiveness criteria for this process are: 1) decision related to the finding of nonconformity no later than 2 working days, 2) follow-up on the finding of nonconformity is on schedule, and 3) the nonconforming service finding and the follow-up are reported management review meeting. These criteria will then be used to evaluate whether the process is working effectively or not. Table 3 shows the NCS control process objectives and scope

Table 2. The Theme of process analysis

Process Objectives/Effectiveness Criteria: Input: Output:						
No	Aspect	ISO 9001 Requirement	Existing System Condition	Comply with ISO 9001	Opportunities for Improvement	Action needed
1	Action	There is action to eliminate NCS				
		The action may one or more of the following ways: <ul style="list-style-type: none"> <li>• Correction</li> <li>• Segregation, containment, return or suspension of provision of products and services</li> <li>• Informing the customer</li> <li>• Obtaining authorization for acceptance under concession</li> </ul>				
2	Document	Contains the nonconformity, the action taken, any concessions obtained and the authority deciding the action on the nonconformity				

Table 3. The Objective and scope of NCS control process

Process Name : NCS Control			
Input	Output	Objectives	Effectiveness Criteria
The finding of nonconforming service (during the preparation of service or during the service provision)	<ul style="list-style-type: none"> <li>• Action to resolve nonconformity</li> <li>• Nonconforming service report in management review meeting</li> </ul>	To control services that do not conform to company standards and to prevent nonconforming services are delivered to customers	<ul style="list-style-type: none"> <li>• Decision related to the finding of nonconformity no later than 2 working days</li> <li>• Follow-up on the finding of nonconformity is on schedule</li> <li>• The nonconforming service finding and the follow-up are reported in management review meeting</li> </ul>

## 4.2 Existing NCS Control System Mapping

Data collection regarding the existing NCS control system was conducted through observation and interview. Based on the data collected it is known that currently, the company has an informal system for controlling nonconforming services. Furthermore, the system has not been documented and standardized. The system is run by habit. If nonconforming services are found, the reporting of the finding of nonconformities is done by habit and operator instinct. Then the handling decision is done spontaneously. There is no established mechanism for the decision-making process.

The mechanisms for handling nonconforming services that have been running in the company are as follows. When an operator finds nonconforming service in the production area, the operator reports the finding of nonconformity to the section head. If the section head can't make decisions regarding the handling of nonconformity, the section head reports the nonconformity to the production head. Furthermore, if the production head can't take a handling decision, then the production head reports to the general manager. If described in a flow diagram, the existing nonconforming service control system in the company can be seen in the Figure 2.

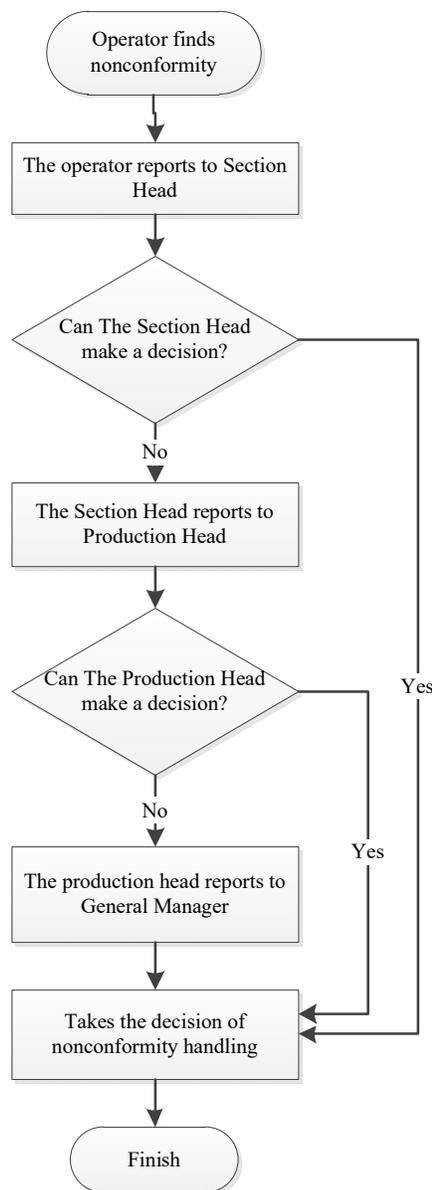


Figure 2. The flow diagram of the existing nonconforming service control system

Some of the nonconforming services that are usually found are the number of clothing does not match the bill because the clothing is lost or in exchange for other consumers and there is damage to the clothing after the washing process. Although several times nonconforming services have been found, the company has not yet specified a list of nonconformities (what conditions are included in the nonconformity) and the handling action needed. It causes the handling process of nonconformities is less effective and efficient

### 4.3 Process Analysis

Based on the identification results of the existing nonconforming service control system applied in the company, we performed thematic analysis. The results can be seen in table 4. Briefly, it can be said that the existing system is less effective and efficient, as well as has some weaknesses. The weaknesses are:

1. The nonconforming service control system is not standard,
2. There is no list of non-conformities, what conditions are included in the nonconformities that need to be followed up and reported,
3. The handling process of the finding of nonconformity still depends on the boss,
4. The absence of nonconformity handling status monitoring,
5. The system has not been documented and there is no record of the finding of nonconformity, the handling action taken and the handling status.

Table 4. The Results of process analysis

Process Objectives: to control services that do not conform to company standards and to prevent nonconforming services are delivered to customers Input: the finding of nonconforming services Output: action to resolve nonconformity, nonconforming service report in management review meeting Effectiveness criteria: <ul style="list-style-type: none"> <li>• Decision related to the finding of nonconformity no later than 2 working days</li> <li>• Follow-up on the finding of nonconformity is on schedule</li> <li>• The nonconforming service finding and the follow-up are reported in management review meeting</li> </ul>						
No	Aspect	ISO 9001 Requirement	Existing System Condition	Comply with ISO 9001	Opportunities for Improvement	Action needed
1	Action	There is action to eliminate NCS	There is action to eliminate NCS	Yes	The action to eliminate NCS is not standard	To standardize action to eliminate NCS
		The action may one or more of the following ways: <ul style="list-style-type: none"> <li>• Correction</li> <li>• Segregation, containment, return or suspension of provision of products and services</li> <li>• Informing the customer</li> <li>• Obtaining authorization for acceptance under concession</li> </ul>	<ul style="list-style-type: none"> <li>• The action taken against the nonconformity depends on the boss and in accordance with the habit in the company</li> <li>• There is no decision-making mechanism established to regulate the decision making process of nonconformity</li> </ul>	Partial	<ul style="list-style-type: none"> <li>• There is no list of non-conformities, what conditions are included in the nonconformities that need to be followed up and reported</li> <li>• The absence of nonconformity handling status monitoring</li> </ul>	To determine the types of nonconformity that need to be followed up and reported and the actions required to resolve any nonconformities
2	Document	Contains the nonconformity, the action taken, any concessions obtained and the authority deciding the action on the nonconformity	The company has no document related to nonconforming service control	No	There are no guidelines for employees in the nonconforming service handling process	To document the nonconforming service control system

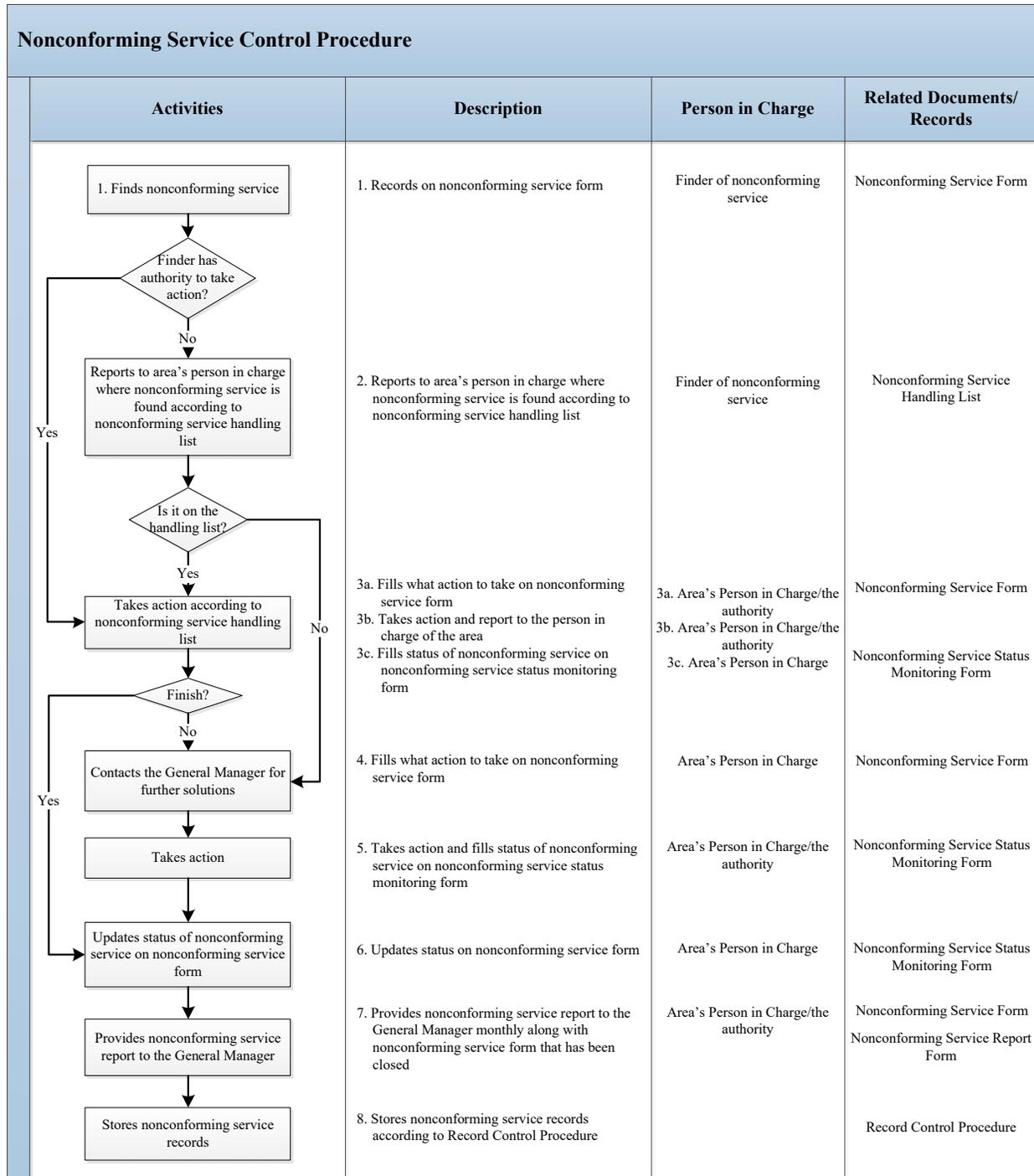


Figure 3. Nonconforming Service Control Procedure

#### 4.4 NCS Control System Formulation

The NCS control system formulation was conducted to improve the existing system. Specifically, it is to eliminate the weakness of the system. The NCS control system formulation consists of three stages:

1. Create nonconforming service control procedure

The procedure was prepared by improving the flow diagram of the existing nonconforming service control system. Some of the new things added in the proposed procedure are:

- the handling process of nonconformities should be done based on the nonconforming service handling list
- the reporting process of the nonconformities finding and the follow-up were clarified,
- a monitoring activity was included to the procedure to monitor the status of nonconforming service

With this procedure, it is expected that nonconforming service handling process is clearer, more effective, and more efficient. For more details, the nonconforming service control procedure can be seen in Figure 3.

2. Develop the nonconforming service handling list

The list can be used as a guide in taking action to deal with nonconformities. The list consists of 4 main components. They are the types of nonconformity, the finder of nonconformity/officer performing the nonconformity checking, the handling process that must be done for any nonconformity, and the person responsible for handling process. In case the nonconformity occurs, then the handling process should be carried out according to the list. The preparation of the list was done by brainstorming with the General Manager and Directors of the company. Based on this process, 24 service nonconformity types in the company obtained. Table 5 is an example of handling process of nonconforming services that have been compiled.

3. Validate the NCS control system

The proposed NCS control was validated by discussion with the Director and General Manager of the company.

Table 5. Examples of Handling Process of Nonconforming Service in the Company

Area	Area's Person in Charge	Item	Nonconforming Service		Checker	Handling Action
Washing	Head of washing section	Order package per kilogram / unit	The number of clothing does not match the number written on the bill (prior to the washing process)	Do not pass checks done with counting (check 100% order)	Washer	<ul style="list-style-type: none"> <li>• Segregate order and place it on nonconforming service area</li> <li>• Head of washing section reports to production head</li> <li>• The production head contacts the outlet which accepts the order</li> <li>• The outlet operator contacts the customer</li> </ul>

**4.5 Implications**

This research aims to design nonconforming services (NCS) control system for ISO 9001 implementation in a service company. The system was built to control services that do not conform to company standards and to prevent nonconforming services are delivered to customers. Practically, this paper contributes the NCS control system content which can be used as a reference when an organization wants to develop it. The NCS control system in this research has an advantage. The NCS system requires the organization to have a list of nonconformity and how to handle it. The existence of the list will accelerate the response of nonconformity handling and as knowledge control. In addition, this paper also gives contribution related to effectiveness parameter or objectives of the NCS control process, namely to control services that do not conform to company standards and to prevent nonconforming services are delivered to customers. Furthermore, to evaluate the effectiveness of NCS control system, this research gives examples of criteria that are: 1) decision related to the finding of nonconformity no later than 2 working days, 2) follow-up on the finding of nonconformity is on schedule, and 3) the nonconforming service finding and the follow-up are reported on RTM.

In addition, this paper also contributes to system development methodologies. The methodology used in this paper integrates the requirements of ISO 9001: 2015 with Business Process Improvement (BPI). The methodology can be used if the organization wants to develop the system. Theoretically, this research fills the gap in the literature that discussed nonconforming services (NCS) control system in ISO 9001 implementation.

## 5. Conclusion

This research has built a NCS control system for ISO 9001 implementation in a service company. The design of the system was based on the results of the existing NCS control system analysis compared to ISO 9001: 2015 requirements. The proposed NCS control system consists of a nonconforming service control procedure and a nonconforming service handling list. This research fills the gap in the literature that discussed nonconforming services (NCS) control system in ISO 9001 implementation and in practical terms, this paper provides a nonconforming service control system that can be utilized by the company and the methodology used in this paper can be a reference for others service company in designing the NCS control system or others system.

## Acknowledgements

We would like to thank to all quality management research group that have supported this research.

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