MASTER THESIS

INFORMATION AUDIT TRIANGLE FOR PRACTITIONERS

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Abstract

Information audit is a set of actions that examine whether or not the information poses in a company support the organizational mission, goals, and objectives. The examination process is also required as a fundamental step for compliance and information quality checking. As a result, in this digital age, companies have to deal with the complexity and a massive amount of data. They deploy the Information Audit to strengthen their performance.

There are many studies which analyzed the theories, concepts, and practices of information audit. These studies offer improvement opportunities and guidelines that companies can adopt to improve their performance. However, from the systematic literature review done by the author before, there is a deficiency on research which focuses on developing the information audit framework. In particular, a deficiency in the framework concerning the general processes of information audit.

In consideration of the reasons above, this study focuses on designing a framework that covers the general and applicable information audit. In order to evaluate the framework, the case study in two different companies in Indonesia is performed. The purpose of the case study is to check the generality of the framework. The evaluation result shows that our framework is indeed applicable in real life cases and has contributed to the improvement of the framework.

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List of Acronyms

This chapter will contain all of the acronyms defined throughout the document and will be filled while writing.

ACM	Association of Computing Machinery
BAWASLU RI	*Badan Pengawas Pemilu Republik Indonesia* (Election Supervisory Department of Republic of Indonesia)
BPMN	Business Process Modelling Notation
COBIT	Control Objective for Information and related Technology
DBSCAN	Density-based spatial clustering of application with noise
DSRM	Design Science Research Methodology
DWT	Discrete Wavelet Transformation
ElCIA	Electricity Company Information Audit
IA	Information Audit
IEEE	Institute of Electrical and Electronics Engineers
IT	Information Technology
KARS	Komisi Akreditasi Rumah Sakit (hospital accreditation committee)
LSAM	Linux Security Audit Model
PERMENKES	*Peraturan Menteri Kesehatan* (Indonesian Health Ministry Regulation)
PERWASLU	*Peraturan Pengawas Pemilu* (the Bawaslu Law)
PPID	*Pejabat Pengelola Informasi dan Dokumentasi* (Information and Documentation Management Officer)
RSAI	*Rumah Sakit Al Islam* (Islamic General Hospital)
SSM	Soft System Methodologies
SWOT	Strengths, Weaknesses, Opportunities, Threats

CHAPTER 1 - Introduction

The chapter will provide the background information of Information Audit, then elaborate the problems which are the foundation of the study. Besides, the chapter defines the research goals and the research question of the research. The last part of the chapter elaborates the structure of the thesis report.

1.1. Background

Nowadays, organizations and companies are intended to pay more attention to the information they own and collected. Henczel (2001) states that companies put the information as one of the most critical strategic assets thus companies are advanced to manage, control, and develop the information resource to information users. Furthermore, the volume of information has multiplied in the manifold, and the information exchange between organizations or departments has increased which made the communications information-intensive (Nath, 2017). Besides that, companies are facing the challenge to optimize their treatment of the information so that it could meet the organizational strategies and objectives. In order to address the problem, information audit could be utilized by companies as a stable method for enhancing the information quality. The information audit enables the companies to align the goals of the organization with the information resources and services and to analyze the business processes that support the organization's key business objectives. The report of the audit also can be utilized as a reference to develop the information policy. (Henczel, 2001)

Due to its benefits to the organizations, researchers developed the theory, concept, and methodology of information audit (Burk & Horton (1988), Andrade, Prada, Muniategui, & Firpo, (1994), S. Buchanan & Gibb (2008), Orna (1999), Henczel (2001)). They also published several of their work on the implementation of information audit in various organization's environment (Botha & Boon (2003), Bing & Bo (2014) and Shariff, Ariffin, Latif, & Nadzir (2013)). Therefore, Henczel (2001) asserts that there is no universally accepted model for the information process due to its various structures, natures, and circumstances. These facts lead to various methods and other supported tools of information audit process presented since its first development in 1988, a study by Burk and Horton in developing the structured process of information audit. Several studies identified the methodologies and recent research on information audit (S. Buchanan & Gibb (2008) and Frost & Choo (2017)).

1.2. Problem Definition

Based on one of the findings in the earlier literature study which collected and then categorized the existing methods, frameworks, and techniques of information audit, there is a lack of study on developing information audit framework that focuses on the general purpose of information audit (see section 3.7). The finding also supported by a study by Frost & Choo (2017) which addresses the shortage of the framework development and suggests researchers design a framework that can be employed by various business scenario. Moreover, most of the framework in Information Audit

is filled with ad hoc solutions, i.e., the framework fits only for a specific context. For example, a framework called the Linux Security Audit Model (LSAM) can only be applied for LINUX. (Wu & Qu, 2009) Besides that, the ElCIA (Electricity Company Information Audit) framework by Drus et al., (2008) that is designed explicitly for electricity companies.

1.3. Research Goals

The objectives of this research are filling the gap of information audit research particularly in developing the framework as suggested the study by Frost & Choo (2017). More specifically, the study aims to develop a framework that is generally applied by practitioners of information audit. Furthermore, the framework developed in the study is designed to be applied in a diverse field thus gives more options for the researcher and practitioner to explore the processes of information audit. The framework also offers a comprehensive step-by-step of information audit processes from the preparation of audit to the post of the audit.

1.4. Research Questions

This section defines the research questions of the thesis. The main research question is as follows:
"How to develop a generally applicable information audit framework for practitioners based on the existing domain specific information audit frameworks in the scientific literature?"
The following subquestions support the main research question:

1. What aspects should be covered in the information audit framework?
2. How generally applicable the framework in practice?
3. How to evaluate the usage of the framework in an organization?

1.5. Thesis Structure

The structure of the thesis is explained as follows. In Chapter 1, the background or the motivations of this research are explained which is followed by the list of the research question and the report structure. Chapter 2 gives theoretical backgrounds which are intended to understand the topic of the research. The next chapter, Chapter 3, explained the method which is employed to develop the framework in the research. Chapter 4 shows the process of developing the framework. The evaluation of the framework which is implemented in two case studies is explained in Chapter 5. Then, Chapter 6 concludes the finding of the research and defines several recommendations for further research.

CHAPTER 2 – Research Methodology

The chapter describes the methodology that we used during the study. Design Science Research Methodology (DSRM) by Peffers et al. (2008) was chosen as our methodology due to its suitability with the goals and the research questions of the research as elaborated in the previous section (1.3 and 1.4). The alignment between the research and the methodology can be seen in the last section of this chapter. The section will first introduce the DSRM then explain the implementation of the methodology to the study.

2.1. Design Science Research Methodology Approach

DSRM proposed by Peffers et al. (2008) as a production and a presentation of design science in information system research. It is motivated by the result of their study on the development of information system research from the early 1990s. Peffers et al. (2008) argue that the results from the information system research were inadequate since the findings are mostly descriptive which borrowed from natural and social science. The trend might lead to the deficiency of the essential part of the information research in creating acts to the solutions of problems, in other words, a design science. Therefore, DSRM integrates the processes that have been done by the researcher that could integrate the design science process to the field information science research. The complete processes in the DSRM are listed below:

1. Problem Identification and Motivation
   The first activity of DSRM is defining the problem and justifying the solution. These activities are useful to develop the artifact and to check whether the solution could cover the complexity of the problems.
2. Define the objectives for a solution
   The research can decide the desire of the research in this activity whether the objective of the research is quantitative or qualitative. The input for the stage is the problem specification, current situation and the effectiveness of the solutions.
3. Design and development
   A design research artifact can be any artifact which embedded the research contribution. The stage includes defining the feature of the artifact, its architecture and then develop the artifact.
4. Demonstration
   The stage shows how the artifact could solve the defined problem in an experimentation, simulation or case study.
5. Evaluation
   Evaluate how the artifact supports a solution to the problem. The form of the evaluation could be various; it depends on the nature of the problem and venue artifact.
6. Communication
   The last part of the research is to communicate the process of the research and its results. The report includes the problems, the artifacts, its novelty and other relevant information that can help researchers and audiences or professionals.

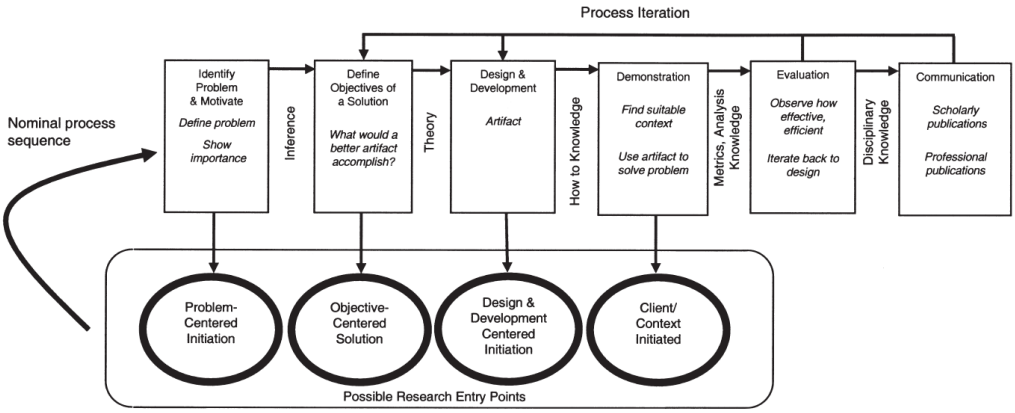

Figure 1. DSRM Process (Peffers et al., 2008)

2.2. Mapping Peffers' to The Thesis

The section describes the implementation of DSRM in this study. The study was started by doing the systematic literature review as stated in the previous subsection. The literature review can be considered as the problem identification and motivation. In this process, several problems in the information audit field are retrieved and then add several values for the motivation to do further research. From several problems acquired, the author selected the problem that is feasible to be researched regarding the time constraint and resources. After selecting the problems, the objective of the research particularly the objective of the solution or the artifact is constructed. The problem definition, motivation, and objectives are documented in Chapter 1, Chapter 2 and Chapter 3 as can be seen in Table 1.

Table 1. Mapping this report thesis to Peffers's DSRM

Chapter	Mapping to DSRM
1 – Introduction	Problem identification and Motivation Define the objectives for a solution
2 – Research Methodology	
3 – Literature Review	
4 – Develop the framework	Design and Development
5 – Case Study	Demonstration Evaluation
6 – Conclusion, Discussion and Limitation	Communication

The design and artifact development are reported in Chapter 4. The detail process of the artifact development is depicted in Figure 5. In Chapter 5, the demonstration and evaluation process of the

study are remarked. The demonstration of the artifact was done by doing the case study while the evaluation was based on the result of the demonstration. Then the last part of this study is communication of the findings and the suggestions of several insights for further research.

CHAPTER 3 – Literature Review

The third chapter discusses information audit and its components, namely the methods, techniques, and frameworks which are addressed from the systematic literature review conducted by the author. A method is a systematic way of doing something, and a technique is a way to collect the data. (Thomas, 2017) Meanwhile, the framework of information audit is described as the guidelines for the practitioners and the model of implementing the audit concept. (Dalibor & Branko, 2016) The structure of this chapter follows the order of systematic literature review research questions which will be explained in section 3.1.

3.1. Literature Review Methodology

The systematic literature review was done before this study. The objective of the study is to answer the research questions that were constructed during the literature review. The research questions are followed:

(RQ1) What methods of Information Audit exist from its emergence until 2018?
(RQ2) What frameworks of Information Audit exist from its emergence until 2018?
(RQ3) What techniques exist by Information Audit to support its processes?
(RQ4) Is there any categorization for finding methods, frameworks, and techniques of Information audit?

In order to answer these questions, the processes of a systematic literature review by Kitchenham & Charters (2007) are applied. We divided the process into 5 phases started from *phase 0*. Here is the detail of each step:

1. Phase 0 - Developing the inclusion and exclusion criteria
   In phase 0, the inclusion and exclusion criteria were derived from setting the limitation of the literature review.
2. Phase 1 – Application of search string to database sources
   The query for searching the sources in the selected databases is constructed before. Then in phase 1, the search string is applied to retrieve the sources from prominent literature databases such as Scopus, Science Direct, Springer, IEEE, and ACM Digital Library.
3. Phase 2 – Removing the duplicate articles
   Several database sources might have the same articles. Therefore, several articles were retrieved several times. Then in this stage, the duplicate sources were removed.
4. Phase 3 – Title and abstract based selection
   The next step was filtering the article based on the title and the abstract based on the inclusion and exclusion criteria.
5. Phase 4 – Full-text selection
   The last phase in this selection process is reading the full text of the results that have been filtered before. The authors discussed the information extracted from the previous stage and make sure that the study correlated to our research questions.
   The steps of the systematic literature review are depicted in Figure 2.

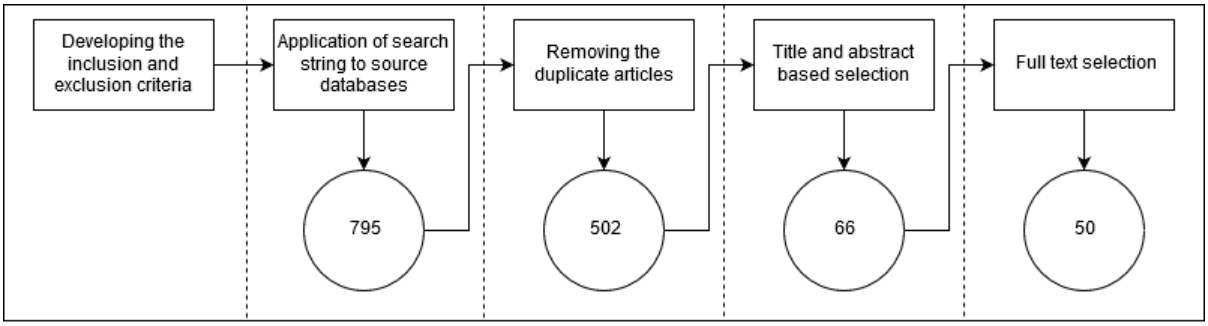

Figure 2. Selection Process

3.2. Introduction to Information Audit

Orna (1999) suggest the definition of information audit developed by the Information Resources Management Network of Aslib as "a systematic evaluation of information use, resources, and flows, with verification by reference to both people and existing documents, in order to establish the extent to which they are contributing to an organization's objectives." While Buchanan & Gibb (2008) simplify the definition into the identification and evaluation of the information flow and information resources of an organization toward an effective and efficient information system.

3.3. Information Audit Methods

This section provides several studies that mention methods that are adapted to the practice of Information Audit.

Table 2. List of Information Audit Methods

Method	Description	Studied by
InfoMap	Addressing the management of information resources.	Burk & Horton (1988)
Cost-benefit methodologies	The method is chosen when a company needs to compare the daily basis cost and perceived benefit.	Ellis, Barker, Potter, and Pridgeon (1993)
Geographical approach	Mapping the relation of components between the system and emphasis the system analysis.	
Hybrid approaches	Combining the geographical and cost-benefit approach.	
Management Information Audits	Underline the weakness in the reporting system	
Operational Advisory Audit	Addressing the usefulness of information system in	

	supporting the organization, ensuring the legalization compliance and the effectiveness of the resources.	
Computer Audit	Checking the data quality such as the correctness, monitoring the standard operation of the system and analyzing the risk both from the system and human error perspective.	Andrade, Prada, Muniategui, & Firpo (1994)
Universal Method	A top-down approach which is completed by the toolset that can help the practitioner to implement the method.	S. Buchanan & Gibb, (1998)
Orna's method	It is an improvisation of the InfoMap by Burk and Horton (1998) which emphasize the information resource and the information flow.	Orna (1999)
Henczel Method	It is a method that well-known as seven stages method which combines the strength of Orna's and Buchanan and Gibb's method.	Henczel (2001)
Method of Judging Duplicate	The method combines some techniques to recognize the similarity in semantic words.	Liu, Wei, & Wang (2012)
Scoreboard Database Audit	It is an independent measurement tool of the database auditing result.	Rus (2015)

The list of methods in Table 2 is acquired from the scientific literature collected for the previous study. From the list of the methods, it can be seen that the methods which cover and address the essential value of information audit are the universal method by Buchanan and Gibb (1998), Orna's method (1999) and seven stages method by Henczel (2001). While the others, such as cost-benefit approach, hybrid approach, and management information audits are assumed as the foundation knowledge for the more recent methods. From the analysis of the existing method, this study will focus on adapting the information audit activities from the seven stages method by Henczel (2001) due to its comprehensiveness.

3.4. Information Audit Frameworks

The author found five Information Audit frameworks that acquired from the systematic literature review. The author also added another framework that is relevant for the study.

Table 3. List of Frameworks

Framework	Description	Characteristics	Study
ElCIA	The framework was designed specifically for the electricity company in Malaysia. The framework consists of two layers namely business strategy and information strategy. The business strategy represents the electricity companies' environments while the information strategy covers the information audit exercises.	The framework aligns the business strategy with the information strategy.	Drus, Salbiah, & Shariff (2008)
Linux Security Audit Model (LSAM) Framework	LSAM was developed by Wu & Qu (2009) mainly for the security domain in the Linux operating system. This framework utilizes the audit log and inquiries by using database technology.	It contains three modules and specifically designed for the Linux operating system.	Wu & Qu (2009)
Auditing Methodology for IT Compliance	The main features of this framework are its components and lifecycle auditing. The components consist of Auditing domain and process, evaluation indices and reference model	Focus on the IT compliance perspective on Enterprise Information System	Kim (2011)

	while the lifecycle audit which consists of the auditing, interpretation, and recommendation follows the order of the components respectively.		
Security audit for e-government	Analyze and tracing the event from the internet log.	This framework was developed based on multi-agent and data mining.	Bing & Bo (2014)
Smart Auditing	It is influenced by the smart computer concept. The framework considers the utility of advanced tools or techniques for audit processes, some technique for business rules and some mechanism of adaptation to the findings of the audit.	The state of the art of this framework is utilizing the process mining for the compliance checking.	Bukhsh (2015)
Improved COBIT Framework	The COBIT framework has the core process those are information criteria, plan and organize, acquire and implement, deliver and support, and monitor and evaluate	The framework itself takes into account the business and governance objective as their input and outcome.	Tingliao (2016)

As mentioned above, the frameworks listed in Table 3 are collected from the systematic literature review except for the SMART Audit by Bukhsh (2015). The SMART Audit was included in this study since the framework also classified as an information audit framework, and its components are sufficient to be analyzed in this study. The document of SMART Audit provides detail information on its component and process of the framework. From the list, we could identify that all of them were designed for a specific purpose of information audit and specific business environment. These frameworks also selected since the documentation provide enough information to be extracted by the authors.

3.5. Information Audit Techniques

There are various techniques applied in the process of information audit, and the use of the techniques depends on the audit's purpose. Based on the exploratory study, the techniques that we collected can be classified into three groups: analysis, algorithm, and miscellaneous. The analysis is a collection of techniques that are utilized for examining the data. Meanwhile, the algorithm group consists of techniques which provide a step-by-step procedure to operate. The last group, miscellaneous, is used for techniques that cannot be categorized either an algorithm or analysis. The categorization of the techniques helps the study to analyze the trend among the techniques.

3.5.1. The Analysis Techniques in Information Audit

Table 4 provides the list of analysis techniques found during the research. There are twelve techniques which are collected in analysis techniques categorization.

Table 4. Analysis Techniques in Information Audit

Technique	**Function**	**Study**
SWOT Analysis	Analyzing the strength, weakness, opportunity, and threat of an organization.	Evan-Wong & de Freitas (1995)
Information Mapping	Analyzing the information flow in the organization.	Dimond (1996)
SSM with Critical Success Factor Analysis	The study does not mention clearly about the function of this method.	Dimond (1996)
Shadowing/Case Study Analysis	Observing an environment where the researcher immerses in the job/task that is analyzed.	Cortez (1999)
Audit Log	Examining the use of the logs to retrieve the pattern of the usage.	Cortez (1999)
Analysis of Archival Records	Examining the internal data used in an organization such as internal mail, phone records, and e-mail exchanges.	Zwijze-Koning & De Jong, (2005)
Ecco Analysis	Studying the simple communication chains in the organization.	Zwijze-Koning & De Jong (2005)
NUD.IST (Qualitative Data Analysis)	A software package that helps the researcher to develop theory through the data that they have explored in a study.	Bacigalupo, Fox, & Levy (2005)

Cost/Value Analysis	Analyze the value of information resources.	Steven Buchanan & Gibb (2008)
Top-Down Strategic Analysis	Understanding the department goals and illustrate the role of effective information management.	Steven Buchanan & Gibb (2008)
Force Field Analysis	Identify the negative or positive impact of CSF on the strategic objectives.	Steven Buchanan & Gibb (2008)
Enterprise Architecture	Analyze the principles, methods, models that are used in the enterprise's organizational structure, business processes, information systems, and infrastructure.	Lankhorst (2009)
Meta-Network Analysis	Validating the relationships and entities which are formed into log management infrastructure.	Anastopoulos & Katsikas (2016)

From the record in Table 4, it can be seen that almost half of the collected techniques focus on organizational analysis and relate to the business environment domain, for instance, SWOT Analysis, Ecco Analysis, Meta-Network Analysis, Top-Down Strategic Analysis and Analysis of Archival Records (Anastopoulos & Katsikas (2016), Evan-Wong & de Freitas (1995), Zwijze-Koning & De Jong, (2005)). Meanwhile, the remaining techniques have a specific focus on the object of the information itself such as the use of logs in Audit Log and information resources in Cost/Value Analysis.

3.5.2. The Algorithm in Information Audit

The other categorization for the technique is the algorithm. Regarding the objectives of each algorithm, it could be seen that each algorithm is used for different type of information such as text, image or log events. For the text, the studies utilized the Bayes algorithm and multi-pattern matching algorithm while for the image the studies utilized image content filtering (Tang, Liang, Wang, & Jia (2007) and Yu, Huang, Xu, Dai, & Zhu, (2005)).

Table 5. The Algorithm in Information Audit

Technique	**Function**	**Study**
Image Character Filtering	Supervising the badness image content by implementing the image segmentation.	Yu, Huang, Xu, Dai, & Zhu, (2005)

Image Content Filtering	Filtering the badness information which is embedded in a picture.	Fei, Yue, Ji-yao, Ling-fen, Miao-Jjang (2006)
Local Model-Checking	Verify the accuracy of a finite-state system which is depicted as a state transition graph.	Mateescu (2006)
Bayes Algorithm	This algorithm is used for text categorization.	Yu, Shen, Huang, Xu, & Dai (2006)
Multi-Pattern Matching Algorithm	It is used for processing the multi-language mixed text in network information audit.	Tang, Liang, Wang, & Jia (2007)
Discrete Wavelet Transformation (DWT)	Selecting sensitive object files in the object set for sensitive security audit events.	Wang & Yang (2008)
Density-based spatial clustering of application with noise (DBSCAN)	Clustering the events that correlate in time for sensitive security audit events.	Wang & Yang (2008)

3.5.3. The Miscellaneous Techniques in Information Audit

This category is for the techniques or methods that could not be included either for analysis or the algorithm type.

Table 6. The Miscellaneous Techniques in Information Audit

Technique	**Function**	**Study**
Sociometric Questioning	Identify the communication frequency	Zwijze-Koning & De Jong, (2005)
Diary Research	Collecting data about communication in the specified time frame.	Zwijze-Koning & De Jong, (2005)
Small-World Technique	Studying the flow of messages in an organization.	Zwijze-Koning & De Jong, (2005)
Observation Research	Studying the communicative behavior of small groups.	Zwijze-Koning & De Jong, (2005)
Usage Review	Identify the information needs of groups of users.	Evan-Wong & de Freitas (1995)
Budget Review	Identify the expenditures of product-by-product and customer-by-customer	Evan-Wong & de Freitas (1995)

From the four techniques listed in Table 6, the dimensions are in the business process and monitor with the different focus for instance to the record of communication, message flow communication behavior.

3.6. Dimensions of Information Audit

In this study, the categorization was done by analyzing the purpose and the dimension of the information audit. The categorization is divided into the business process, compliance, monitor, and security. The study which has an objective of analyzing and enhancing the current structure organization and their business performance such as InfoMap by Burk and Horton (1998) are categorized into the business process dimension. The study which considers the information policies such as Top-Down Approach by Orna (1990) is categorised into the compliance dimension. The study which has the domain of audit in monitoring the system such as the computer audit by Doherty (1990) is categorised as a monitor dimension. Then the last category, security, is an audit that takes into account the protection of the information in the organization such as the Scoreboard Database Audit by Rus (2015).

Table 7. Categorization of Methods

Methods\Dimension	Business Process	Compliance	Monitor	Security
Computer Audit (Doherty, 1990)			X	
Universal Method (Buchanan & Gibb, 1998)	X			
InfoMap (Burk and Horton, 1998)	X			
Top – Down Approach (Orna, 1999)	X	X		
Henczel (S. Henczel, 2006)	X			
Judging Duplicate (Liu et al., 2012)			X	
Scoreboard Database Audit (Rus, 2015)				X
Cost-benefit approach (Ellis et al., 1993)			X	
Geographical Approach (Ellis et al., 1993)	X			
Hybrid Approach (Ellis et al., 1993)	X		X	

Information Management Approach (Ellis et al., 1993)			X	
Operational Advisory Audits (Ellis et al., 1993)		X		

Table 8. Categorization of Frameworks

Framework\Dimension	Business Process	Compliance	Monitor	Security
ElCIA	X			
Auditing Methodology for Enterprise Information System		X		
LSAM (Linux Security Audit Model)				X
Security Audit Framework for E-Government				X
SMART Auditing		X		
COBIT		X		

Table 9. Categorization of Techniques

Technique/Dimension	Business Process	Compliance	Monitor	Security
Analysis of Archival Records			X	
Audit Log	X			
Bayes Algorithm			X	
Budget Review	X			
Cost/Value Analysis	X		X	
Density-based spatial clustering of application with noise (DBSCAN)				X
Diary Research			X	
Discrete Wavelet Transformation (DWT)				X
Ecco Analysis			X	
Force Field Analysis	X		X	

Image Character Filtering			X	
Image Content Filtering			X	
Information Mapping	X			
Local Model-Checking			X	
Meta-Network Analysis		X		
Multi-Pattern Matching Algorithm			X	
NUD.IST (Qualitative Data Analysis)		X		
Observation Research			X	
Shadowing/Case Study Analysis	X			
Small-World Technique			X	
Sociometric Questioning			X	
SSM with Critical Success Factor Analysis	X			
SWOT Analysis	X			
Top-Down Strategic Analysis	X		X	
Usage Review	X			

The result of the categorization in Table 7, Table 8 and Table 9 shows that the methods, frameworks, and techniques cover all dimensions. Particularly for methods and techniques, more than half of them focus on business and monitor dimensions. Meanwhile, the spreading of dimensions for each framework is evenly distributed.

3.7. Finding in the Literature Review

One of the outcomes of this study is a metric in Appendix A that record the substantial information from each study that we gathered. The metric helped the authors to extract interesting and important trends that show during the study. Therefore, this section will provide a highlight of several trends in methods, frameworks, and techniques of Information Audit that need attention from researchers.

There is a limited study which focuses on developing methods of Information Audit since 2001.
The recent method found in this research is scoreboard audit by Rus (2015) and method of judging duplicate by Liu et al. (2012). However, there is a big gap between the method of judging duplicate

(Liu et al., 2012) and the seven stages method by Henczel (2001). The study could not find any methods developed between the period 2001 to 2012. In addition, even though the finding shows in Figure 3, shows that article published from 2008 to 2017 are more than from 1993 to 2007, the focus of the studies from 2008 to 2017 is not merely on information but there was a shift from information audit to knowledge audit (Levantakis et al. (200z8), Roberts (2009), Gourova (2009), Sukiam (2009), Xiao (2010), Daghfous & Khawaja (2010), Ganasan & Dominic P (2011), Shahmoradi et al. (2015), Shahmoradi et al. (2016)).

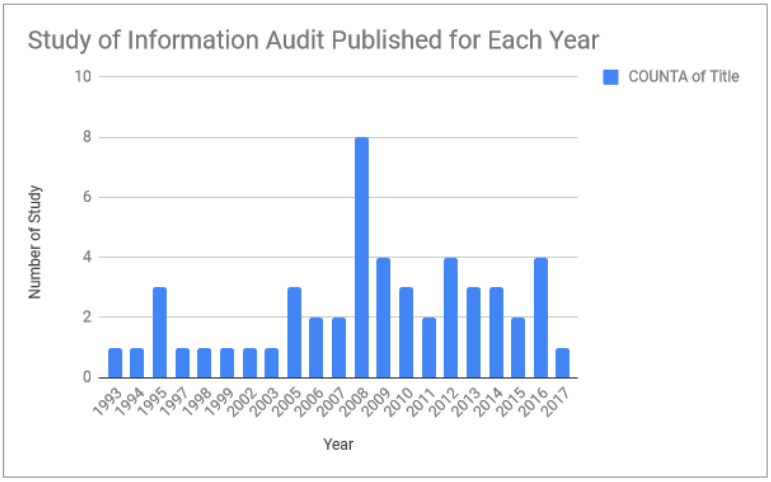

Figure 3. The number of studies published in a year

The current methods were not applied in most of the practice of Information Audit.

The articles are split into two types: the one discussing only the theory of Information Audit and the articles that describe the implementation of existing theories into practice. This research shows another trend, that is the studies which focus on developing the theory are dominant which account for 58.3%. It can be concluded that the studies which highlight the implementation or outcome of the information audit need more attention from both the researcher or practitioner. The previous statement also supported by a study from R.B. Frost & Choo (2017) which states that there are more observations to the development of theory than information audit application. The fact that should also be highlighted is the current methods such as Henczel (2001), Orna (1999) and Buchanan & Gibb (1998). The methods were not applied in the most articles that focus on practice as recorded in the metrics in Appendix A. Among the 21 studies which focus on practice, there are only three studies that applied and combine those methods, Fu & Zhang (2009), Jones et al. (2013) and Ariffin et al. (2014).

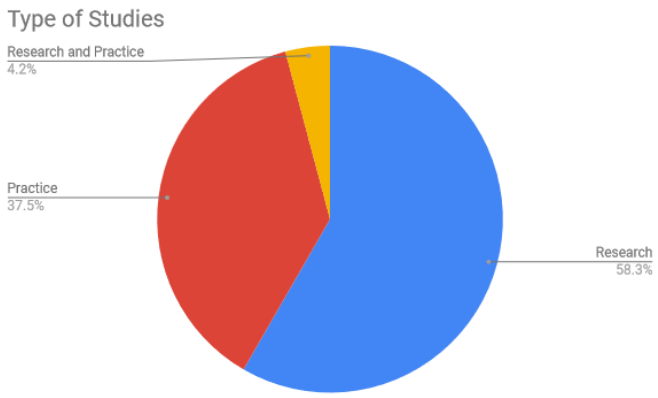

Figure 4. The percentage of studies based on the type of studies

The lack of study that concern on developing a framework that specifically focuses on the Information Audit.

Among the 50 studies in this research, there is only one framework which focuses on the process of information audit, Integrated information audit framework for electricity companies (ElCIA) by Drus et al. (2008). It is one of the six frameworks that we described in Section 3.4. However, it does not mean that the other five frameworks mentioned in the previous subsection are not focused on the information audit. The remaining frameworks are an extension from the purpose of information audit such as LSAM by Wu & Qu (2009) and security audit in e-government by Bing & Bo (2014) that has a specific purpose on checking the security of the system while the study by Tingliao (2016) employed COBIT which is a comprehensive framework for IT audit.

There are no standardized techniques for Information Audit.

Regarding the list of techniques collected in the study which more than twenty techniques, it could be concluded that there are no standardized techniques for information audit due to its varied purposes. Henczel (2001) also mentioned since the environment where the information audit conducted are diverse, so there is no universally accepted model. Another fact is that the techniques for information audit come from various background theory such as strategic planning and math. For instance, SWOT (Evan-Wong & Freitas (1995)) analysis which is commonly used in strategic planning while the example of techniques that come from mathematics is Bayes Algorithm (Yu et al. (2006)) and Multi-Pattern Matching Algorithm (Tang et al. (2007)).

Several methods of Information Audit are utilized in Knowledge Audit.

Roberts (2009) states that the outcome of the information audit which is the explicit and tangible evidence of content that is realizable, observable and transferable is the essential content for knowledge audit. So, it could be assumed if there is a relation between an information audit and knowledge audit. Furthermore, some of the methods of information audit also categorized as

knowledge audit methods such as Buchanan and Gibb (1998), Orna (1999), and Henczel (2001) as stated in a study by Shahmoradi et al. (2015) and Levantakis et al. (2008).

3.8. Conclusion

Based on the studies from a collection of information audit literature, the methods and techniques of information audit are various. Researchers and practitioners developed and applied them based on the purposes of the audit. However, the thing that should be underlined in the literature review section is the existing frameworks collected in this chapter are identified that they were designed for specific purposes. Therefore, the result leads to a question on how to develop a general information audit framework. The question will be answered in the next chapter.

CHAPTER 4 – Creating the Framework

Chapter 4 will first explain the process of developing the artifact and then elaborate the detail of each component of the artifact. The detail of each component consists of the input, process, output, and technique for each stage.

4.1. Designing the Information Audit Triangle

This section describes the process of designing the information audit triangle. The processes of designing the framework are divided into four stages as depicted in Figure 5 which was started by acquiring the existing IA framework and ended by defining the information audit triangle components. The detail of each process will be described in the following sections.

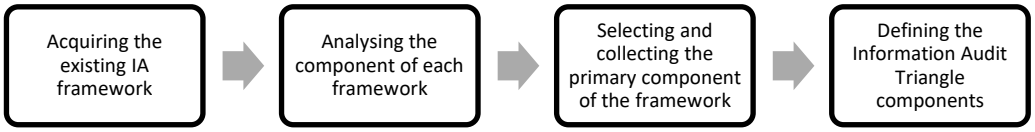

Figure 5. The Process of Designing Framework

4.1.1. Acquiring the Existing Information Audit Framework

The process of designing the framework utilized several parts of the systematic literature review findings particularly the finding on the existing framework. From the systematic literature review, the authors acquired four frameworks which a few of them are designed for specific purposes and specific business environment (see subsection 3.4). For instance, the ElCIA framework by Drus et al. (2008) which was designed specifically for the electricity company. While the others, the two frameworks left, are designed for security purposes. For example, the LSAM framework by Wu & Qu (2009) which is designed for security purposes. The list of the reference of the frameworks can be seen in Table 3 (see subsection 3.4).

4.1.2. Analyzing the Component of Each Framework

After gathering the frameworks, then the author extracted the essential information from the frameworks in a metric (see Appendix C). The information that was extracted are the components, processes, methods, drawback, and limitation from each framework. For example, the framework by Kim (2011), Information audit for IT Compliance. The component for the framework is Auditing, Interpretation, and Recommendation. Meanwhile, the processes are planning, execution, reporting, and feedback.

4.1.3. Selecting and Collecting the Primary Component of the Framework

Based on the information collected in Table 8, the author selected the most common component that could be applied generally in several business sectors. The first selected component is planning. Planning was selected since the 3 out of 6 frameworks include the planning component as the part of their framework (Drus et al. (2008), Kim (2011), Tingliao (2016)). While the rest of

the frameworks (Wu and Qu (2009) and Bukhsh (2015)) goes directly to the audit process. The condition also considered as the limitation of these frameworks.

The second component is the collection of the audit process itself. The audit process is the core component of the framework; there are no frameworks which omit the audit process component. The form of the audit processes is various since each framework was derived based on specific purposes. In this study, the author selected the typical process of auditing. The activities used in the information audit triangle are adopted from methods by Orna (1999), Buchanan & Gibb (1998) and Henczel (2001). In addition, the techniques that will be applied in the framework also acquired from the list of techniques in section 3.5. The detail of the process will be explained in the next subsection 4.1.4.

While the last component of the framework is the post-audit. There is no framework which excludes the post-audit part. However, there are several differences between an audit report from each framework. For instance, Kim (2011) proposed an evaluation index as the audit report while Bukhsh (2015) report the resume of the current business situation to the decision makers.

Through the selection process, then the study comes up with a model that is depicted in Figure 6.

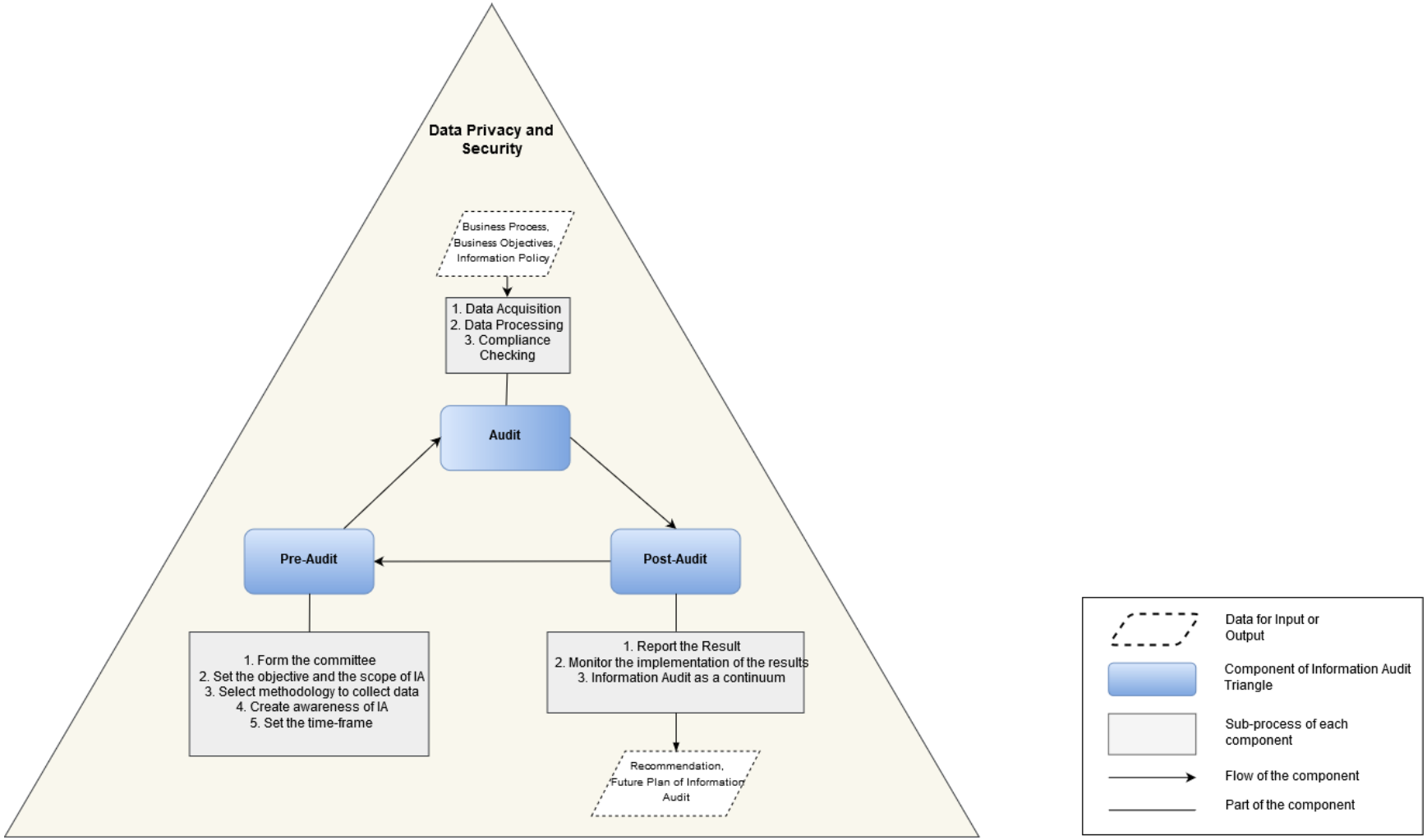

Figure 6. The Information Audit Triangle

4.1.4. Defining the Component of Information Audit Triangle

a. Pre-Audit

Pre-Audit is the initial stage of the audit where the planning process takes place. The pre-audit stage is essential since the outcomes of pre-audit stage affect the remaining process of audits such as the required data and the relevant methodology that should be taken for the audit stage.

Table 10. Pre-Audit Stage

Element	**Instrument and Description**
Input	- Pre-Audit Questionnaire
Output	- The structure of Information Audit Committee - Information Audit Objectives - The planning documentation of Information Audit - Time-frame of Information Audit
Activities	1. *Form the formation of the information audit committee that is responsible for organizing, controlling and monitoring all audit processes.* The main tasks that will be processed in the stage are: • Form the structure of information audit committee which consists of the head of the information audit committee and the member. The number of members depends on the scope of the audit and the size of the organization. • Identify the roles, tasks, and goals. 2. *Set the objectives and the scope of information audit.* The process helps the information audit committee to expect how extensive the information audit is and decide the methodology to follow during the audit process. The main tasks of the process are: • Define the explicit objectives of the information audit. • Select the department that will be involved during the process of information audit. • Determine the type of information needed. 3. *Define the methodology* Based on the type of information that decided in the prior stage then we can decide the suitable methodology. Three elements should be considered during the selection of the methodology: • How the rule set and audit data will be collected. • How data will be analyzed. • How data will be evaluated. 4. *Set the time-frame* The time-frame contains the list of tasks that will be performed in a specific period. It helps the committee to

	monitor whether the process of information audit on the track or not. Set the time-frame also reduces the risk of missing information needed or processes that should be taken. 5. *Create an awareness of the information audit among the employees.* The process aims to gain a supportive environment while the audit process is conducted. The main task that should be taken in the stage is to inform the goals of information audit through the information sharing medium that used in the company.
Technique	- Survey - Observation Research

b. Audit

The audit is the core of the information audit framework where the processes of auditing are conducted. The aim of the audit stage is acquiring the current situation of the information provision then compare them with the business objectives of the department.

Table 11. Audit Stage

Element	**Instrument and Description**
Input	- Business Objectives The objectives of companies or departments in the organization is needed to see the alignment between the information resource, information system applied and business strategy in the organization. - Business Process and Information Flow Documentation Information flow and business process documentation is an additional document to monitor the information in the organization. - Regulation or Standardization In order to do the compliance, the audit requires the regulation or standardization applied in the business process of the company.
Output	- Current Business Process Model (De Facto) Current business process modeling is a process that currently applied in the company. - Desired Business Process Model (De Jure) The desired business process model is a business model which is modeled based on the implementation of the existing regulation to the business process in the organization.
Activities	1. Data Acquisition

	In this step, the information needed during the audit is collected. 2. Data Processing In this stage, the collected data will be analyzed and evaluated. The main tasks of these processes are: - Preparation of the collected documentation from acquisition part. - Identify the current information provision. - Identify the information flow among the business process. - Identify the future information requirements. 3. Compliance Checking The compliance checking is the core of the information audit process. In this step, the information provided (de facto) will be compared to the existing business rules and the legislation (de jure) that is used as the reference of the business processes in a company. The information collected also will be compared to the business objectives. 4. Data Security and Privacy During the information audit, several critical and sensitive information might be acquired. Therefore, data security regarding data privacy is our concern during the process of the audit.
Technique	- Survey - Interview - Questionnaire - Information Mapping - Business Process Modelling

c. Post-Audit

This stage contains a set of activities which concern on the result of the audit then decide the next action that should be taken. The three activities in this component will be explained in Table 12.

Table 12. Post-Audit Stage

Element	**Instrument and Description**
Input	Post-Audit Questionnaire
Output	a. Recommendation b. The Future Plan for Information Audit
Activities	1. Report the result. The result of the audit will be transformed into a recommendation. After that, the author publishes the

	recommendation to the manager and other employees that in the department where the audit takes place. 2. Monitor the implementation of the results. Regarding the implementations of the results, the following are the tasks that should be prepared by the committee: a. Understand the change process b. Develop an implementation program c. Implementation d. Develop a post-implementation strategy 3. Information Audit as a continuum Creating awareness among the employee that information audit become a regular process in the organization. The main tasks of this process are: a. Measure and assess changes b. Develop an ongoing process of matching services with needs
Technique	Survey

4.2. Conclusion

Based on the study on the existing information audit frameworks, the study created a general framework called the Information Audit Triangle for practitioner which are divided into three components, pre-audit, audit and post audit. The primary input for this framework is the objectives of the company, the regulation, and the current business process documentation. These inputs then will be analyzed by doing the activities in the Audit process. The final output from this framework is a recommendation for the management of the organization. The techniques that can be applied in this framework can be adjusted based on the business needs and the knowledge of the practitioners.

CHAPTER 5 - Case Study

The chapter provides the motivation of doing the case study and then report the implementation of the framework in the two case studies. In addition, the chapter discusses the analysis of the implementation result which will be the input for the improvement of the framework.

5.1. The Purpose of Case Study

The purpose of doing the case study is to perform the demonstration and the evaluation of the framework. The case study also part of answering the 3rd research question of study (see subsection 1.4). Evaluation and demonstration could support the study by showing how the artifact solves the defined problem in an experimentation or case study. The case study also supports the study on evaluating how artifact provides a solution to the problem. (Peffers et al., 2008)

5.2. The Requirement for Selecting the Case Study

In order to meet the goal of this study, several requirements are derived as follows:

a. The framework can be implemented minimum in two organizations or companies.
b. The company should at least implement an information system to support their business process.
c. The organization utilizes at least one information system in their business process.
d. The company or organization should implement a standardization or regulation in their business process.
e. The company is willing to share several documents that can support the research.

5.3. Apply the Framework

Based on the requirements which are explained in the previous section, the study decided to apply the framework in two companies in Indonesia. Due to the sensitivity of information that will be requested in this audit, the two companies required the researcher to provide a letter of authorization from the university before doing the audit. The first company is a hospital in Bandung, West Java Indonesia, namely Islamic General Hospital (RSAI). In this hospital, the audit mainly focused on auditing the medical record system in the hospital.

Meanwhile, the second company is a governmental organization namely Election Supervisory Department of Indonesia (BAWASLU RI). The focus of audit in BAWASLU RI is analyzing the implementation of the information openness regulation from the government of Indonesia. This section will provide the report of framework implementation in both companies.

5.3.1. Islamic General Hospital (RSAI) Bandung Report

The section will first provide the company profile then followed by the implementation of the three stages of information audit triangle. The first one is pre-audit then the audit and the last one is post-audit.

Company Profile

Figure 7. The logo of Islamic General Hospital Bandung

Islamic General Hospital Bandung is one of the prominent and largest hospitals in Bandung. The hospital was established in 1st August 1990. In its 28 years, the hospital has been proliferating. Hence, they have 139 doctors and 951 employees. Another achievement of RSAI is they acquired a perfect accreditation from the hospital accreditation committee of Indonesia (KARS).

The slogan of RSAI is "*Sahabat anda menuju sehat bermanfaat*, your best friend to be healthy" therefore they have the vision to be a hospital which is lead, trusted and an Islamic in its service and education. From its vision, we could see that the unique character is including the Islamic value in the service and the working principle. Meanwhile, following are the list of the mission of Islamic General Hospital Bandung:

a. Applying and implementing Islamic values neither in the service or the management of the hospital.
b. Support and help the governmental program in health and education.
c. Making a cross-collaboration between the sector and participate actively in embracing the general in health in the citizen.
d. They are providing a health service which satisfies customers and beyond their expectations.
e. They have a comprehensive education which covers the intellectual part, mental, spiritual and creativity which creates a student which has a noble character and professional.
f. They are developing skills and wealth of its human resource.

Besides the mission, the goals are listed in the following sentence:

a. Giving a qualified health service to the citizenship which concerning the Islamic Value.
b. Make the hospital as their health institute which beneficial to citizenship (*Rahmatan Lil 'Alamin*) and always carry all the hospital elements to a value of Tauhid[1].

[1] Tauhid meaning here is to belief that Allah is the only God in the world. (https://id.oxforddictionaries.com/translate/indonesian-english/tauhid)

c. They are providing health services to the community through professional standards and professional ethics by taking into account the latest developments in science and technology.
d. They are providing health services to the community by paying attention to affordability and equal attention to the needs and the poor people.
e. Encourage and train candidates for health professionals who have good character by the objectives of teaching the hospital.
f. Grow users of community hospital services to improve their health status.
g. They are providing satisfying health services that even exceed what is expected of all hospital patients.
h. Implement a patient safety system at the hospital.
i. Conduct activities aimed at developing potential workers.
j. Develop efforts to improve worker welfare.

According to one of the goals of the company, "*Providing health services to the community through professional standards and professional ethics by taking into account the latest developments in science and technology.*", RSAI operates the Hospital Information System which covers almost all the services in the hospital.

Pre-Audit

The Information Audit Committee

- Head of Information Audit Committee: Eva Nurlatifah
- The Member of Information Audit Committee: Indah Rahayu
- Supervisor of Information Audit Committee: Dr. Guntur
- The respondents of the Information Audit: Representatives from each department that involved in the medical record business process.

The Objectives and the Scope of Information Audit

a. The objectives of the information audit
    - Analyze the information flow on the medical record business process in the Al Islam General Hospital particularly in the adaption to the latest hospital information system which was implemented in August 2018.
    - Analyze the implementation of the Indonesian Health Ministry Regulation (Menteri Kesehatan Republik Indonesia, 2008).
b. The scope of information audit
    The scope of the audit is the medical record business process in the hospital information system.
c. The type of information needed
    - Business Process Documentation for the medical record.
    - The legislation that is implemented in the medical record.

The Methodology of Information Audit

Based on the type of information needed and the information provision in the hospital, then the following methodologies were chosen:

- The data will be collected through the interview and analyze supporting documents.
- The data will be analyzed through the business process modeling.
- The data will be evaluated by doing the gap analysis by comparing the ideal medical record business process scenario based on the regulation to the current medical record business process.

Set the Time Frame

Table 13. The time frame for Islamic General Hospital

Information Audit Processes	Time																			
	1st Week (November)					2nd Week (November)					3rd Week (November)					4th Week (December)				
	12	13	14	15	16	19	20	21	22	23	26	27	28	29	30	3	4	5	6	7
Pre-Audit																				
Audit																				
Data acquisition																				
Data Processing																				
Compliance Checking																				
Post Audit																				
Report the result of																				
Monitor the implementation of the results																				
Measure and assess changes																				

Audit

Data Acquisition

The process of acquiring data in the audit stage was done by doing a structured interview with the representatives from departments which involved in the business process of medical record. The following is the list of interview participants:

- Ani Sutarsih – Supervisor of Register Department
- Firman Aulia S.Kep.Ners – Head of Inpatient Installation
- Arif Rahman – Supervisor of Surgical Clinic
- Dedi Firmansyah - Head of Pharmacy Department
- Nanang Sukarna - Head of Medical Record Department

From the interview, we acquired the medical record business process and the implied regulation. Some of the business processes that they gave us were not entirely in a written document but also simple explanation (oral presentation).

Regarding the implied regulation, they apply the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008[2]. In general, the legislation regulates the type of data in the medical record, process on saving and destroying the medical record and the rules on its data and privacy. However, in this audit process, there are parts of the regulation that we exclude. The reason is that the point in that part is out of the scope of this audit, particularly, the 9th article of the Permenkes 269/2008 which is related to the saving and destroying the medical record. In that part, it is stated that "Medical records on non-hospital health care facilities must be stored for at least 2 (two) years from the last date the patient was treated.". From that statement, we could see that this regulation is not for the hospital. Therefore, we exclude this part from the study.

Data Processing

The data processing was done by transforming the interview and the regulation to the business process models, a list of data needed, and a list of regulation related to data privacy and security. This report will first model and extract the data and business rules from the regulation, in other words, the de jure model. After that, model the business process which is acquired from the structured interview. The tools that used to model the business process is BPMN (business process modeling notation). Meanwhile, the data field in the medical record and the business rules are collected in tables.

- De Jure of Creating Medical Record

Figure 8 is depicted based on the Indonesian Health Ministry Regulation in article 5 of chapter 3 (Permenkes No 269/2008). This part defines the management procedure of medical record. The procedures that are explained in this chapter are below:

1. Every doctor or dentist in carrying out medical practice must make a medical record.
2. The medical record referred to in point (1) must be made immediately and completed after the patient receives service.
3. Making medical records as referred to in point (2) is carried out through recording and documenting the results of medical examinations, actions and other services that have been given to patients.
4. Every recording in the medical record must be affixed with the name, time and signature of the doctor, dentist, or individual health personnel who provide health services directly.
5. In the event of an error in recording the medical record, corrections can be made.
6. The stipulation as referred to in point (5) can only be made by way of scribbling without eliminating records that are corrected and affixed with the names of doctors, dentists, or specific health personnel concerned.

[2] https://www.scribd.com/document/355230331/Permenkes-No-269-Menkes-Per-III-2008-Rekam-Medis

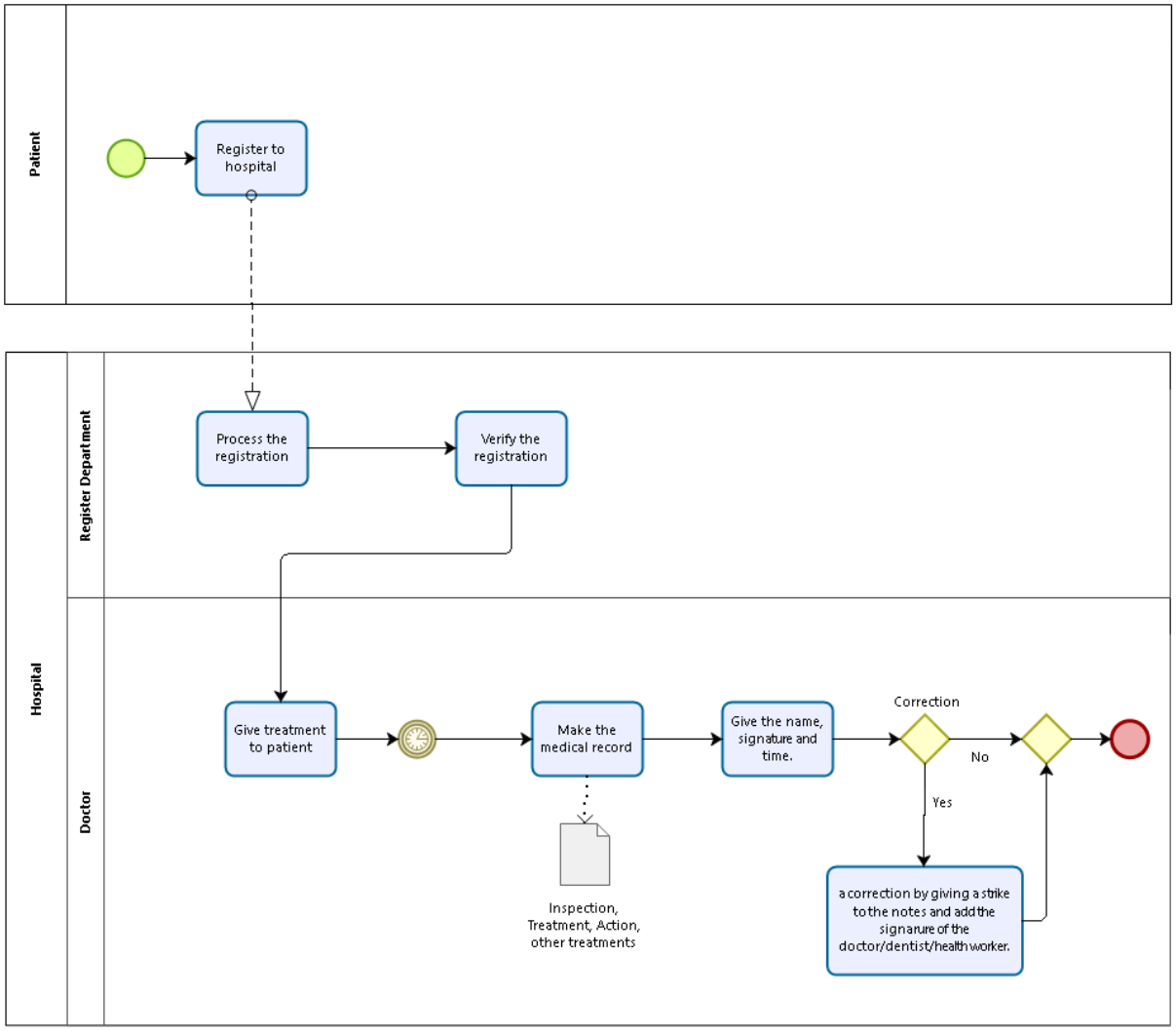

Figure 8. Creating Medical Record (De Jure)

- De Jure of Saving and Destroying Medical Record

  The model of saving and destroying medical recorded was adapted from the Indonesian Health Ministry Regulation chapter 4 article 8 (Permenkes No. 269/2008). The whole chapter 4 (Permenkes No. 269/2008) explains storage, disposal, and confidentiality. However, in this model, we mainly focus on the information for the storage and disposal procedures. The procedures for storing and destroying are explained below:

  1. Medical records of inpatients in hospitals must be kept for at least 5 (five) years from the last date the patient was treated or discharged.
  2. After the 5 (five) year time limit as referred to in point (1) is exceeded, the medical record can be destroyed, unless the discharge summary and the approval of medical action.

3. The summary of the return and approval of medical actions as referred to in point (2) must be kept for a period of 10 (ten) years from the date the summary was made.
4. Storage of medical records and return summaries as referred to in point (1) and point (3) shall be carried out by officers appointed by the head of the health service facility.

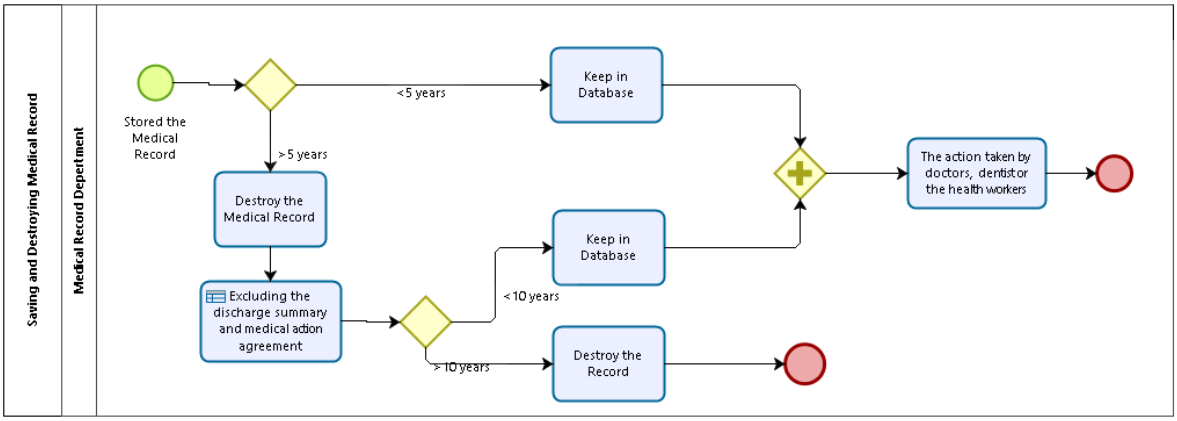

Figure 9. Saving and Destroying Medical Record (De Jure)

- List of Information Needed in A Medical Record Based on the Law

Beside the management procedure of medical record, the law also regulates the field that must be filled in a medical record. Three types of medical record define in this law, outpatient, inpatient, and emergency medical record. However, the law also adds several additional information that specifically addressed for the patient in disaster. The contents from Table 14 to Table 17 are adapted from chapter 2 article 3 of the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008. The chapter is mainly focused on the types and contents of the medical record.

Table 14. Medical Record for Outpatient

Medical Record for Outpatient
Personal Detail of Patient
Date and Time
Anamnesis Result
Physical Inspection Result and Supported Medic
Diagnosis
Management Plan
Treatment and Action
Other treatments that are given to the patient
Odontogram clinic for dental patient
Agreement of actions when it is needed

Table 15. Inpatient Medical Record

Medical Record for Inpatient
Personal Detail of Patient
Date and Time
Anamnesis Result
Physical Inspection Result and Supported Medic
Diagnosis
Management Plan
Treatment and Action
Other treatments that are given to the patient
Notes of clinic observation and treatment result
Discharge summary
Name and signature of doctor/dentist/health worker
Odontogram clinic for dental patient
Agreement of actions when it is needed

Table 16. Medical Record for Emergency

Medical Record for Emergency
Personal Detail of Patient
Conditions when patients arrive at health care facilities
The identity of the patient companion
Date and Time
Anamnesis Result
Physical Inspection Result and Supported Medic
Diagnosis
Management Plan
Treatment and Action
Summary of treatment before leaving the emergency and planning of further treatment
Name and signature of the doctor, dentist, health worker
Transportation facilities used for patients who will be transferred to other health care facilities
Other treatments that are needed by the patient

Table 17. Additional Information for Patient in Disaster

Additional Information for Patient in Disaster
Type of disaster and location where the patient is found
Type of emergency and number of massive disaster patient
An identity that found the patient

- Data Privacy and Security Regulation

As stated in the previous section, the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008 also includes the data privacy and security of the medical record. All business rules related to the data privacy and security are explained in several parts of chapter 4 and chapter 5 (Permenkes No. 269/2008). The rules from those chapters are extracted to Table 18.

Table 18. Data Privacy and Security (De Jure) (Permenkes No 269/2008)

Data Privacy and Security
Article 10
1. Information about the identity of the diagnosis, history of the disease, examination history and medical history of the patient must be kept confidential by doctors, dentists, certain health personnel, management officers and leaders of health care facilities.
2. Information about identity, diagnosis, disease history, examination history, and history of treatment can be opened regarding: a. for the patient's health interests; b. fulfills the request of law enforcement officials in the context of law enforcement on court orders; c. request and the patient's agreement; d. requests for institutions/institutions based on statutory provisions; and e. for research, education, and medical audits, insofar as they do not mention the identity of the patient;
3. The request for a medical record for the purpose as referred to in point (2) must be made in writing to the head of the health service facility.
Article 11
1. A description of the contents of the medical record may only be carried out by the doctor or dentist who treats the patient with the patient's written permission or based on legislation.
2. The head of the health service facility can explain the contents of the medical record in writing or directly to the applicant without the patient's permission based on the legislation.
Article 12
1. The medical record file is belonging to the health service facility.
2. The contents of the medical record belong to the patient.
3. The contents of the medical record as referred to in point (2) in the form of a summary of the medical record.
4. A summary of the medical record as referred to in point (3) may be given. Recorded, or copied by the patient or person who is authorized or with the written consent of the patient or the patient family who is entitled to it.
5. The use of medical records can be used as: a. health care and treatment of patients; b. evidence in the process of law enforcement, medical discipline, and dentistry and enforcement of medical ethics and dental ethics; c. educational and research needs; d. based on health service fee payers; and

	e. data on health statistics.
6.	The use of the medical record as referred to in point (1) letter c which states the identity of the patient must obtain written approval from the patient or his heir and must be kept confidential.
7.	The use of medical records for educational and research purposes does not require patient consent if it is done in the interest of the state.

- De Facto of Creating Medical Record

The model in this section is adapted from the interview with the representative of the departments which are involved in the process of creating a medical record. The interview involved registration, outpatient clinic, inpatient, pharmacy and medical record department. From the interview, the participants not only described the process of creating a medical record but also the data that should be input in the form of a medical record. However, this section will focus only on the business process of creating a medical record.

After analyzing the result of the interview, there are four essential actors or departments in the process. The first one is patients, then outpatient clinics, inpatient clinics, and the medical record department. In the audit process, we also interviewed the pharmacy department. However, regarding the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008, information related to the pharmacy department is not mentioned in the law then the study assumed that the information could be omitted from the analysis process.

From Figure 10., the first process is patient registration. RSIA has three types of patients: general, BPJS and contractor. These three types have a different procedure for registration. However, the model does not describe the whole process of registration since the study focuses on the distribution of the medical record. Therefore, the process of registration is concluded to the two main processes. The first one is the patient register to the hospital after that they give their personal detail to the registration department.

The next stage of this process is in the registration department. The following are the detail of the process:

1. The staff checks the status of the patient whether the patient is registered or not.
2. If the status of the patient is already registered in the hospital, then the staff will call or retrieve the medical record of the patient then send the file to the desired outpatient clinic through the hospital information system.
3. If the status of the patient is unregistered, then the staff will input the personal detail to HIS then send the medical record to the desired outpatient clinic.

After receiving the medical record from the registration, a nurse and a doctor fill in the form of medical record-based the patient complaint and the doctor inspection. When the treatment in polyclinic is done, then the doctor decides whether the patient should be given further treatment in a hospital or not. If the patient should be hospitalized, then the medical record will be distributed to the inpatient department. Meanwhile, when the patient does not

require to be hospitalized, then the medical record will be sent to the medical record department regarding codification and report.

Regarding hospitalized patients, the medical record then will be filled in and updated by doctors and nurses who are responsible for the patient during the treatment. When the treatment ends, then the medical record will be sent to the medical record department and financial department. The medical record in inpatient is not only from the outpatient clinic but also from the emergency patient that need to have further treatment in the hospital. The process of filling in the form of medical record is the same as the patient from the outpatient clinic.

In general, the process of creating a medical record is started by the registration then the data will be distributed to the desired clinic or the inpatient department. Then the medical record will be transferred to the medical record department.

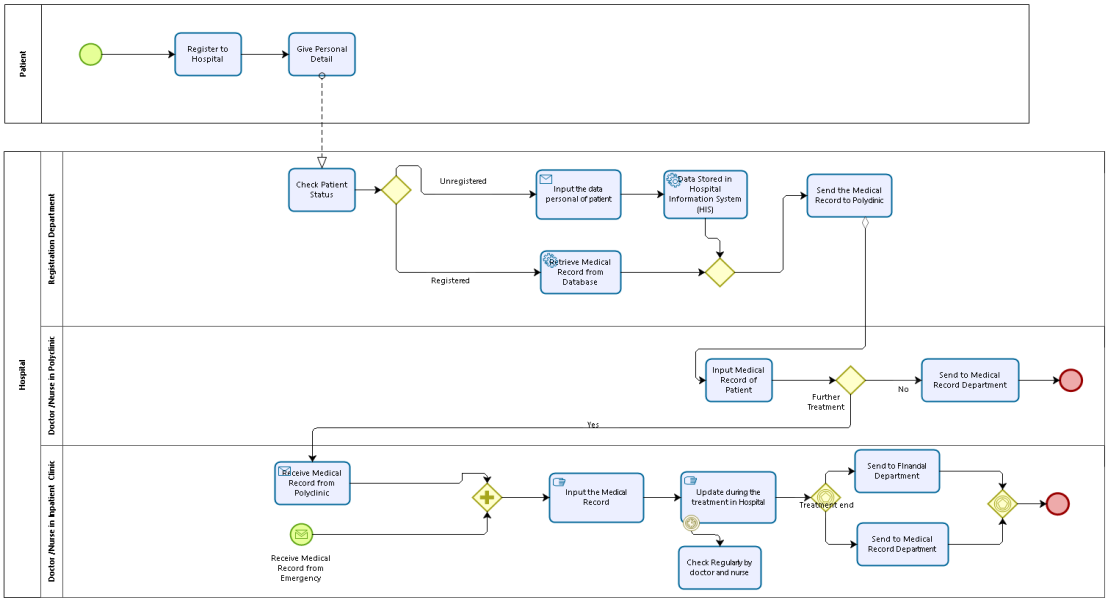

Figure 10. De Facto of Creating Medical Record

- De Facto of Saving and Destroying Medical Record

The process of acquiring this model is same as the creating medical record. The current processes of saving and destroying medical record are related to the processes from the previous subsection. Therefore, the process is started by receiving the medical record from the outpatient clinic, inpatient department and emergency. The following are the list of processes that are modeled in Figure 11:

1. The medical record department receives the medical record from the related clinic.
2. Coders, people who in charge to translate the doctor diagnose into medical record codes, in medical record verify and codify the diagnose in the medical record.
3. After translating the diagnose into codes then the coder input the data into the medical record database and then store them into the database.
4. The medical record that is stored in the database can be utilized for the report regarding the financial and insurance matters.

5. The medical record that is stored for more than five years, will be destroyed from the hospital information system database.

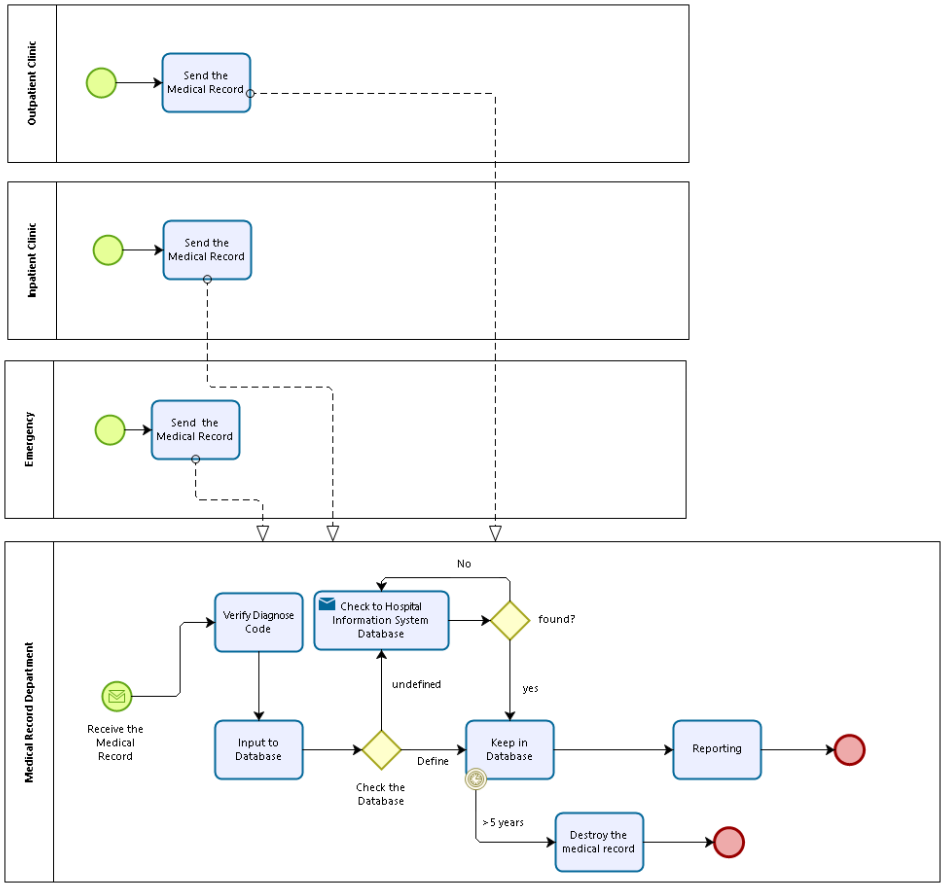

Figure 11. De Facto of Saving and Destroying Medical Record

Compliance Checking

In this stage, the auditor compared the current business process (de facto) to the business process that described in the regulation particularly the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008 (de jure). The first element that will be compared is the type of information that should be included in the medical record form then the business rules related to the data privacy and the last is the business process of creating, saving and destroying the medical record.

- ### Type of Information in Medical Records Form.

  The technique used in this process is making a checklist from the type of information that required in the regulation and the existing data information in RSIA medical record. The checklist is marked based on the analysis of the interview result and the documentation of procedures in the medical record department. As stated in Table 14 to Table 17, there are three types of medical record information and one additional information for the patient in disaster. The checklist of those types of the medical record is collected in a table, Table 19.

Table 19. Comparison of Type Information in RSAI

Medical Record for Outpatient	
De Jure	**De Facto**
Personal Detail of Patient	✓
Date and Time	✓
Anamnesis Result	✓
Physical Inspection Result and Supported Medic	✓
Diagnosis	✓
Management Plan	✓
Treatment and Action	✓
Other treatments that are given to the patient	✓
Odontogram clinic for dental patient	✓
Agreement of actions when it is needed	✓
Medical Record for Inpatient	
De Jure	**De Facto**
Personal Detail of Patient	✓
Date and Time	✓
Anamnesis Result	✓
Physical Inspection Result and Supported Medic	✓
Diagnosis	✓
Management Plan	✓
Treatment and Action	✓
Other treatments that are given to the patient	
Notes of clinic observation and treatment result	✓
Discharge summary	✓
Name and signature of doctor/dentist/health worker	✓
Odontogram clinic for dental patient	✓
Agreement of actions when it is needed	✓
Medical Record for Emergency	
Personal Detail of Patient	✓
Conditions when patients arrive at health care facilities	✓
The identity of the patient companion	?
Date and Time	✓
Anamnesis Result	✓

Physical Inspection Result and Supported Medic	✓
Diagnosis	✓
Management Plan	✓
Treatment and Action	✓
Summary of treatment before leaving the emergency and planning of further treatment	✓
Name and signature of the doctor, dentist, health worker	✓
Transportation facilities used for patients who will be transferred to other health care facilities	?
Other treatments that are needed by the patient	✓
Additional Information for Patient in Disaster	
Type of disaster and location where the patient is found	?
Type of emergency and number of massive disaster patient	?
The identity that found the patient	?

- Data Privacy and Security

The process of comparing the rules of data privacy and security is by providing the regulation from Indonesian health ministry next to the statements which support the law from the documentation of procedures in the medical record department. The statement is completed by the number of reference documents.

Table 20. Comparison of Privacy and Security

Privacy and Security	
De Jure	**De Facto**
Article 10	
1. Information about the identity of the diagnosis, history of the disease, examination history and medical history of the patient must be kept confidential by doctors, dentists, certain health personnel, management officers and leaders of health care facilities.	1. Protect the privacy and patient interest, hospital, doctors, nurse, and other health personnel. (075/YMI/RM/IV/2016) 2. Medical record storage room can only be entered by the medical record staff. (075/YMI/RM/IV/2016)
2. Information about identity, diagnosis, disease history, examination history,	The supported document writes exactly the same as the law. (052/YMI/RM/11/2016)

and history of treatment can be opened regarding: a. for the patient's health interests; b. fulfills the request of law enforcement officials in the context of law enforcement on court orders; c. request and patient's own agreement; d. requests for institutions/institutions based on statutory provided and e. for research, education, and medical audits, insofar as they do not mention the identity of the patient;	
3. The request for a medical record for the purpose as referred to in point (2) must be made in writing to the head of the health service facility.	The supported document writes exactly the same as the law. (052/YMI/RM/11/2016)
Article 11	
1. A description of the contents of the medical record may only be carried out by the doctor or dentist who treats the patient with the patient's written permission or based on legislation.	The patient can request a "patient and family education form" to doctors or other health personnel which include the signature from the patient or patient's family and relatives. (038/YMI/RM/11/2016)
2. The head of the health service facility can explain the contents of the medical record in writing or directly to the applicant without the patient's permission based on the legislation.	Medical Record Department in RSAI filters the request and decide the follow-up action.
Article 12	
1. Medical record file is belonging to the health service facility.	Undefined in the supported document.
2. The contents of the medical record belong to the patient.	Undefined in the supported document.
3. The contents of the medical record as referred to in point (2) in the form of a summary of the medical record.	The patient could request a medical record summary. (044/YMI/RM/11/2016)
4. A summary of the medical record as referred to in point (3) may be given. Recorded, or copied by the patient or person who is authorized or with the written consent of the patient or the patient family who is entitled to it.	The patient can request a "patient and family education form" to doctors or other health personnel which include the signature from the patient or patient's family and relatives.

	(038/YMI/RM/11/2016) (027/YMI/RM/11/2016)
5. The use of medical records can be used as: a. health care and treatment of patients; b. evidence in the process of law enforcement, medical discipline, and dentistry and enforcement of medical ethics and dental ethics; c. educational and research needs; d. based on health service fee payers; and e. data on health statistics.	- The content of the medical record can be transferred regarding: a. for the patient's health interests; b. fulfills the request of law enforcement officials in the context of law enforcement on court orders; c. request and/or patient's own agreement; d. requests for institutions/institutions based on statutory provisions; and e. for research, education, and medical audits, insofar as they do not mention the identity of the patient; (052/YMI/RM/11/2016) - The content of the medical record can be used for the medical service, administration, study or research, and education. (033/YMI/RM/11/2016) - Patient or relatives can request the medical resume as a supported document for an insurance claim. (030/YMI/RM/11/2016)
6. The use of the medical record as referred to in point (1) letter c which states the identity of the patient must obtain written approval from the patient or his heir and must be kept confidential.	Medical information is given to an individual or institution by written permission from patient or relatives or approval from the Director of RSAI which is used for medical interest, law enforcement, education, and research. (027/YMI/RM/11/2016)
7. The use of medical records for educational and research purposes does not require patient consent if it is done in the interest of the state.	(027/YMI/RM/11/2016)

- Business Process Matching
  a. Creating Medical Record

Based on the analysis to both models, de jure and de facto of creating a medical record, it could be concluded that the current business process has already implemented the

processes that set by the regulation. However, there are still several differences since the RSIA use the electronic medical record.

The differences addressed are the procedure to give a signature to the medical record and the procedure of correcting the content of the medical record. In the Indonesian Health Ministry Regulation (Permenkes) No. 269/2008, the doctor should give a signature in the medical record (see figure 8). In the current process, the system has not provided the feature of the digital signature. Therefore, the medical record stored in the database has not included in the doctor signed. The doctor's name and the time will be input automatically from the system.

The second difference is the procedure of correcting the content of the medical record. Based on the law, the health personnel is not allowed to delete the content directly. It should be corrected by giving a strike to the part that will be changed and left the signature next to it. However, in the current process, the system has not provided that kind of procedure to correct the content of the medical record. Therefore, the health personnel could not trace if there are several changes in the medical record. Hence, the content of Figure 10 which shows the current process of creating medical record does not include the process of correcting the content of the medical record.

b. Destroying and Saving the Medical Record

Regarding both models of destroying and saving the medical record (see Figure 9 and Figure 11), there is only one thing that should be underlined from the current processes, the disposal procedure.

The law mentioned that "After the 5 (five) year time limit as referred to in point (1) is exceeded, the medical record can be destroyed, unless the discharge summary and the approval of medical action. The discharge summary and approval of medical actions as referred to in point (2) must be kept for a period of 10 (ten) years from the date the summary was made."

The hospital has already implied the rules to dispose of the medical record which has been stored in 5 years, but, based on the interview and document analysis there is no procedure to exclude the discharge summary and medical action approval from the medical record that will be destroyed and then keep them for ten years.

Post-Audit

Recommendation

After following the steps in the information audit triangle particularly for the pre-audit and audit stage, the study comes to these findings:

a. Regarding the business process, there are three deficiencies found; digital signature, the correction procedure of the system and the exclusion of discharge summary and medical approval action from the medical record disposal which has been stored in 5 years.
b. Regarding the type of information several fields are missed in their medical record:

- Medical Record for Emergency: Identity of a patient companion; Transportation facilities used for patients who will be transferred to other health care facilities.
- All field for the medical record in disaster.

c. Regarding business rules in privacy and security, there are points from the regulation which cannot be found in the medical record procedure in RSAI. The following are the missing articles (Permenkes No.269/2008):
   - Article 12 point 1
   - Article 12 point 2

Hence, it is concluded, RSAI has implemented most of the regulation. RSAI still needs to complete the system with several features that handle the deficiencies of the system that were mentioned in point a & b of the recommendation. RSAI also should add several business rules that are related to the point c of the recommendation.

Lesson Learned

After completing most of the process in the information audit triangle in RSAI, there are several experiences, challenges, and obstacle that researcher faced during the audit that can be added as the lesson learned for this research. The following are the points:

1. The hospital does not record the specific objectives of the department. They mainly elaborate the mission of the hospital as general. Therefore, it is difficult to measure the balance between the department's objective with the current resource information.
2. RSAI has not documented the update business process of medical record with the current hospital information system. Therefore, the process of acquiring data regarding the business process takes a long time since the auditor should model the business process based the result of the interview to all related departments.
3. The process of data acquisition was not efficient since the auditors need to ask information that is missing during the stage of data processing. It is better if the auditor interviews after understanding the reference of regulation comprehensively. Therefore, the questions that are arranged for data acquisition could be more structured and straight to the implementation of the regulation.
4. There are two processes from post audit that could not be done in this research, monitor the implementation of the result and audit as a continuum. These processes could not be performed due to the time constraint of the third party to implement the changes.

5.3.2. Election Supervisory Department of Indonesia (BAWASLU RI)

The section will first provide the company profile then followed by the implementation of the three stages of information audit triangle. The first one is pre-audit then the audit and the last one is post-audit.

Company Profile

Figure 12. Icon of BAWASLU RI

BAWASLU of Indonesian Republic is an institution that has a responsibility to oversee the implementation of the stages of the election, receive complaints, and handle cases of administrative violations, criminal elections, and codes of ethics. It is first established in 2007 considering the law no 22 of 2007 concerning election organizers. The tenure of the management of BAWASLU RI is five years. Hence, the current management was inaugurated on 12th April 2017.

One of the authorities of BAWASLU RI is to appoint, foster, and dismiss members of BAWASLU in all level, provincial, city in Indonesia, and particular chapter in abroad. In total, the number of chapters BAWASLU is 574.

The vision of BAWASLU RI is the realization of BAWASLU as a trustworthy guidance institution in the Implementation of democratic, dignified and qualified elections. Therefore, the BAWASLU has several missions to support the vision. The following are the missions:

- Building apparatus and institutions for election supervisors that are strong, independent and solid.
- Develop effective and efficient patterns and methods of supervision.
- Strengthening the national control system in a structured, systematic, and technology-based supervision management.
- Increase community involvement and election participants, as well as increasing institutional synergy in participatory election supervision.
- Increase the public trust in the quality of supervision performance in the form of prevention and repression, as well as dispute resolution in a fast, accurate and transparent manner.
- Build BAWASLU as a learning center for electoral supervision for both domestic and foreign parties.

In order to realize one of their mission to increase the public trust accurately and transparently, BAWASLU RI employed the regulation from the Indonesian government namely public information disclosure.

In the law, the state regulates the procedure in a public sector to share the public information. The objective of the law also to improve the management and information services within the Public Agency to produce qualified information services.

Pre-Audit

The Information Audit Committee

- Head of Information Audit Committee: Eva Nurlatifah
- The Member of Information Audit Committee: Indah Rahayu
- Supervisor of Information Audit Committee: Haryo
- The respondents of the Information Audit: A representative from public relations department of BAWASLU RI.

The Objectives and the Scope of Information Audit

a. The objectives of the information audit
   - Analyze the business process in the Information and Documentation Management Officer (PPID*)* of Election Supervisory Department of Indonesia.
   - Analyze the implementation of the law of Republic of Indonesia Number 14/2008[3] on the public information disclosure.

b. The scope of the information audit
   The scope of the audit is the process of sharing and updating the public information in the Data and Information Management Officer of BAWASLU RI. Then the audit will focus on the implementation of the Indonesian law number 14/2018 on the public information disclosure to the process of sharing and updating the public information. The process is regulated in chapter IV of the Indonesian law number 14/2018 (UU No. 14/2018) which explains the information that obligated to be provided and published. The process in PPID also regulates in chapter VI (UU No. 14/2018) which explains the mechanism of acquiring the information.

c. The type of Information needed
   - Business Process Documentation for updating and sharing public information.
   - The regulation implemented in data and information service center.

The Methodology of Information Audit

Based on the type of information needed and the information provision in BAWASLU RI, then the following methodology is chosen:

- The data will be collected through the interview and analyze supporting documents.
- The data will be analyzed through the business process modeling.
- The data will be evaluated by doing the gap analysis by comparing the ideal medical record business process scenario based on the regulation to the current medical record business process.

[3] https://ppid.bawaslu.go.id/sites/default/files/regulasi/UU%20No.14%20Tahun%202008.pdf

Set the Time Frame

Table 21. The time frame of BAWASLU RI

Information Audit Processes	Time																			
	1st Week (December)					2nd Week (December)					3rd Week (January)					4th Week (January)				
	13	14	15	16	17	19	20	21	22	23	31	1	2	3	4	7	8	9	10	11
Pre-Audit																				
Audit																				
Data acquisition																				
Data Processing																				
Compliance Checking																				
Post Audit																				
Report the result of																				
Monitor the implementation of the results																				
Measure and assess changes																				

Audit

Data Acquisition

The structured interview and data exploration were carried out to acquire the data that is needed for the audit stage. Since the process focuses on the information from the data and information service center department, therefore the structured interview was done by only interviewing one representative of the department since the interviewee could provide all the information that is needed in this study. BAWASLU RI also only assigned one representative in the process of audit.

The business processes that are addressed in the interview are the updating, sharing and requesting public information about BAWASLU RI which are related to the implemented regulation. Based on the analysis to specific chapters of the law, the content is divided into the type of information obligated to be published and shared, and type of information that is prohibited to be issued and mechanism of publishing public information. The information is explained in chapter IV to VI respectively.

Data Processing

Regarding processing the data, the research transformed the interview and several parts of the regulation to the list of information that should be shared, the business process model of acquiring the public information and the list of information that is prohibited to be published which is related to the data privacy and security. This section will first extract the content from the regulation (De

Jure) then model the current business process of acquiring public information in BAWASLU RI (De Facto).

- De Jure of Information obligated to be published and shared

  Table 22 is adapted from the law of Republic of Indonesia number 14/2008 particularly the chapter IV. The chapter elaborates the rules of updating the public information and type of information that should be issued. However, the article 14th and 15th were omitted from the analysis process regarding the type of organization of BAWASLU RI. BAWASLU RI is a non-governmental organization under the president coordination. Therefore, the article 14th and 15th which regulate the type of information in the state-owned company and political organization could not be included.

Table 22. De Jure of business rules in BAWASLU RI (UU No. 14/2018)

Information Obligated to be published and provided regularly	**Article 9**
	1. Every public sector must announce Public Information periodically.
	2. Public Information as referred to in point (1) includes: a. Information relating to Public Sector; b. Information on the activities and performance of related Public Sector; c. information on financial statements; and / or d. other information regulated in legislation.
	3. The obligation to provide and deliver Public Information as referred to in point (2) is carried out at least 6 (six) months.
	4. The obligation to disseminate Public Information as referred to in point (1), shall be conveyed in a manner that is easily accessible to the public and easily understood language.
	5. The methods referred to in point (4) are further determined by the Information Management and Documentation Officer in the relevant Public Agency.
	6. Further provisions regarding the obligation of the Public Agency to periodically provide and deliver Public Information as referred to in point (1), point (2) and point (3) shall be regulated by the Information Commission's Technical Guidelines.
Information obligated to be published necessarily	**Article 10**
	1. Public bodies must announce immediately information that can threaten the lives of many people and public order.
	2. The obligation to disseminate Public Information as referred to in point (1) shall be conveyed in a manner that is easily accessible to the public and in easily understood language.
	Article 11

information obligated to be provided at any time	1. The Public Agency is obliged to provide Public Information at any time which includes: a. list of all Public Information under its control, excluding excluded information; b. the results of the decision of the Public Agency and its considerations; c. all existing policies and supporting documents; d. the project work plan includes estimates of annual expenditures of the Public Agency; e. Public Agency agreements with third parties; f. information and policies submitted by Public Officials in meetings that are open to the public; g. Work procedures for employees of Public Bodies relating to community services; and/or h. Report on services for accessing Public Information as stipulated in this act.
	2. Public Information that has been declared open to the community based on the complaint's mechanism and/or dispute resolution as referred to in Article 48, Article 49, and Article 50 is stated as Public Information that can be accessed by Users of Public Information.
	3. Further provisions regarding the procedures for implementing the obligations of Public Agencies to provide Public Information that can be accessed by Users of Public Information as referred to in point (1) and point (2) are regulated by the Information Commission's Technical Guidelines.
	Article 12
	Every year the Public Agency must announce information services, which include: a. Number of requests for information received; b. the time required by the Public Agency to fulfill every request for information; c. number of giving and rejecting requests for information; and d. reasons for refusing information requests.
	Article 13
	1. To realize a fast, appropriate, and simple service for every Public Agency: a. Appoint an Information Management and Documentation Officer; and b. Make and develop a system of providing information services quickly, efficiently, and somewhat by the technical guidelines for public information service standards that apply nationally.

	2. The Information and Documentation Management Officer as referred to in point (1) letter a is assisted by functional officials.
	Article 16
	Public information that must be provided by non-government organizations in this Law are: a. Principle and purpose; b. organization programs and activities; c. name, address, management structure, and changes; d. management and use of funds originating from the State Revenue and Expenditure Budget and Regional Revenue and Expenditure Budget, community contributions, and/or foreign sources; e. mechanism of organizational decision making; f. organizational decisions; and g. Other information stipulated by legislation.

- De Jure of Acquiring Public Information Mechanism

  Figure 13 is adapted from the law of Republic of Indonesia number 14/2008 particularly the article 22 of chapter VI. These are the steps described in the regulation:

  1. Each Public Information Applicant can submit a request to obtain Public Information from the Public Agency in writing or unwritten.
  2. The Public Agency is obliged to record the name and address of the Applicant for Public Information, the subject and format of the information and how to submit the information requested by the Public Information Applicant.
  3. The relevant Public Agency must record requests for Public Information submitted in an unwritten manner.
  4. The relevant Public Agency must provide proof of receipt of requests for Public Information as referred to in point (1) and point (3) in the form of a registration number when the request is received.
  5. If the request is submitted directly or by electronic mail, the registration number is given when receiving the request.
  6. If a request is submitted by mail, sending the registration number can be given together with the delivery of information.
  7. No later than 10 (ten) working days after receipt of the request, the relevant Public Agency must submit written notice containing:
     - the information requested is under its control or not;
     - The Public Agency must notify the Public Agency that controls the information requested if the requested information is not under its control and the Public Agency that receives the request knows the existence of the requested information;
     - acceptance or rejection of the request for the reasons listed as referred to in Article 17;
     - if the request is received in whole or in part, information material will be provided;
     - if a document contains excluded material as referred to in Article 17, the excluded information may be blackened with the reasons and material;
     - delivery agent and format of information to be provided; and
     - fees and payment methods to obtain the requested information.
  8. The Public Agency concerned can extend the time to send the notification as referred to in point (7), no later than 7 (seven) following working days by giving reasons in writing.
  9. Further provisions regarding the procedure for requesting information to a Public Agency are regulated by the Information Commission.

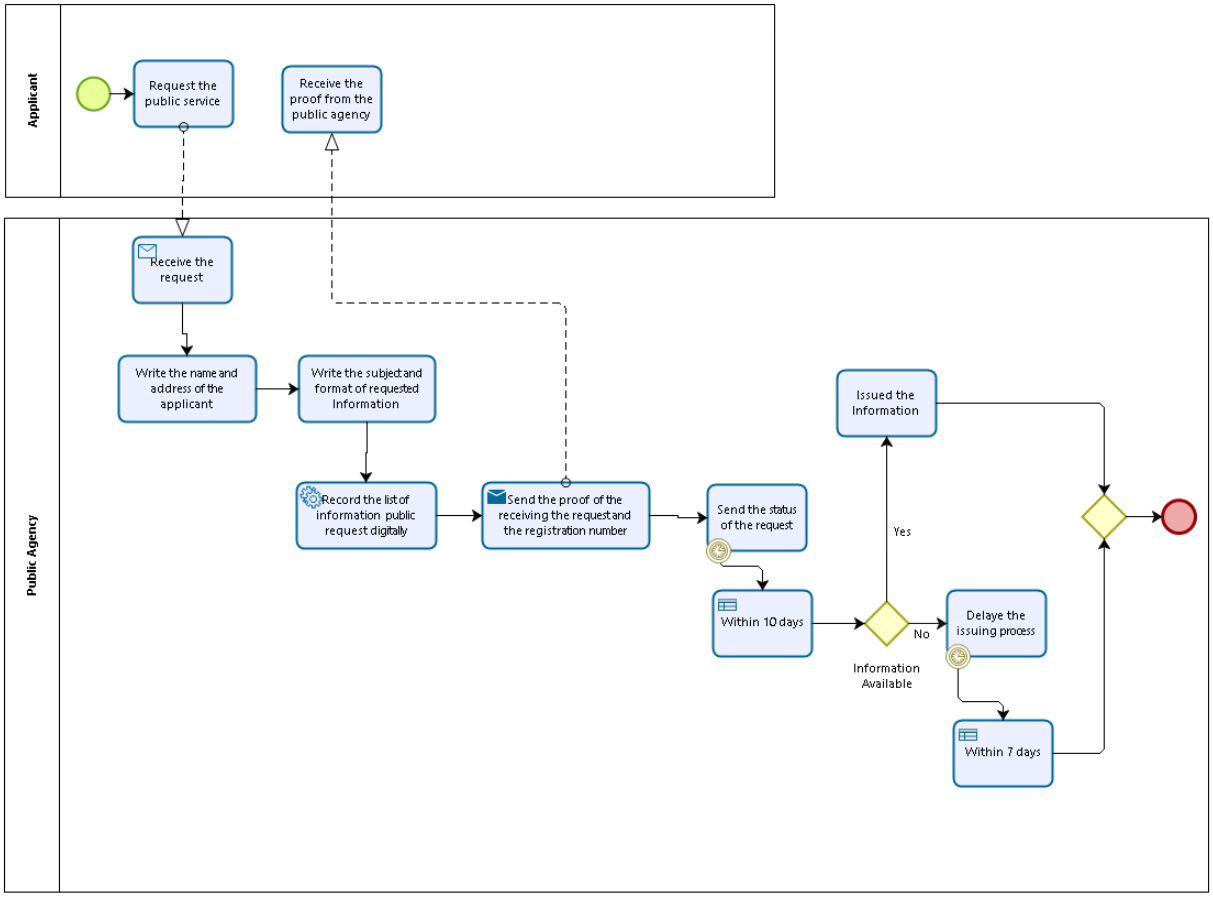

Figure 13. De Jure of Acquiring Public Information Mechanism

- De Facto of Acquiring Public Information Mechanism

The procedure of acquiring public information is provided on the website of the Information and Documentation Management Officer (PPID) BAWASLU RI. The procedure is depicted in a process diagram in Figure 14 and Figure 15. The figure contains the steps for requesting public information in Bahasa Indonesia. The following is the translation of the processes:

1. The applicants send the request to PPID through the PPID Application, mail, fax, email, by phone or directly come to PPID service.
2. The applicants fill in the form and give their copy of personal detail or identity company.
3. The applicants receive the proof of requesting the information from the information staff when all requirements are completed.
4. The applicants receive written notification within ten days.
5. The applicants receive the requested information or a refusal decision letter from PPID.

However, based on the result from the interview, they also add another process. The additional process is the delay time in 7 days if the information has not ready yet to be published.

Figure 14. The process of Requesting Public Information in PPID BAWASLU RI[4]

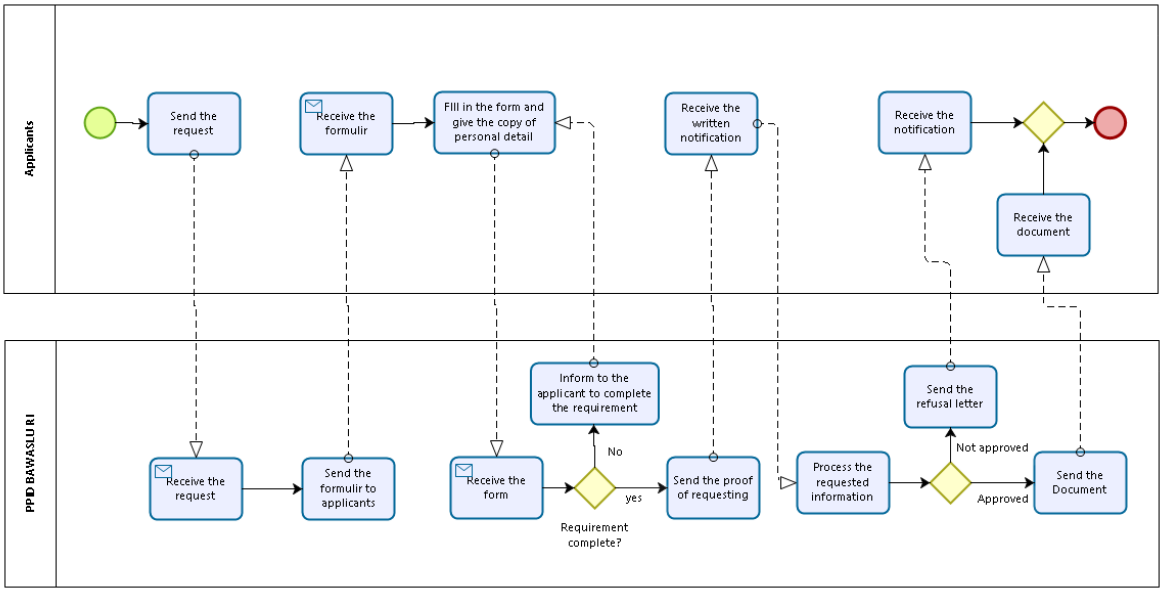

Figure 15. The process of Requesting Public Information in PPID BAWASLU RI (English Version)

[4] http://ppid.bawaslu.go.id/sites/default/files/TataCaraPIv2_0_0.jpg

- De Jure of Data Privacy and Security

  Regarding the data privacy and security, the law of Indonesia number 14/2008 regulates the type of information that could not be published concerning the data privacy and security of the information and the owner of the information as well. Table 23 list the business rules from chapter V particularly article 17th.

Table 23. Business Rules of BAWASLU RI (Data Privacy and Security)

Article 17th
Public Information which if opened and given to Public Information Applicants can hamper the law enforcement process, namely information that can: 1. Inhibiting the process of investigating and investigating a crime; 2. Disclose the identity of the informant, reporter, witness, and/or victim who is aware of a crime; 3. Disclose criminal intelligence data and plans relating to the prevention and handling of all forms of transnational crime; 4. Endanger the safety and life of law enforcers and their families; and/or endanger the security of law enforcement equipment, facilities, and infrastructure.
Public Information which if opened and given to the Public Information Applicant may interfere with the interests of protection of intellectual property rights and protection from unfair business competition;
Public Information which, if opened and given to the Applicant for Public Information, could endanger national defense and security, namely: 1. Information about strategy, intelligence, operations, tactics and techniques relating to the implementation of the state defense and security system, including the stages of planning, implementation, and termination or evaluation in connection with domestic and foreign threats; 2. Documents that contain strategies, intelligence, operations, techniques and tactics relating to the implementation of a state defense and security system which includes the stages of planning, implementation, and termination or evaluation; 3. The number, composition, disposition, or dislocation of the strength and capability in the implementation of the state defense and security system and its development plan; 4. Pictures and data about the situation and circumstances of bases and military installations; 5. Estimates of military and defense capabilities of other countries are limited to all actions and indications of the country which could endanger the sovereignty of the Unitary State of the Republic of Indonesia and / or data related to military cooperation with other countries as agreed as confidential or very secret; 6. State coding system; and / or 7. State intelligence system.
Public information which if opened and given to the Public Information Applicant can reveal Indonesia's natural wealth;
Public information which, if opened and given to the Applicant for Public Information, could harm the resilience of the national economy: 1. The initial plan of buying and selling national or foreign currencies, shares and vital assets of the state;

2. The initial plan for changes in exchange rates, interest rates, and operating models of financial institutions; 3. The initial plan for changes in bank interest rates, government loans, changes in taxes, tariffs, or another state/ regional income; 4. The initial plan of sale or purchase of land or property; 5. Initial foreign investment plan; 6. Process and results of supervision of banking, insurance, or other financial institutions; and 7. Matters relating to the process of printing money.
Public Information which, if opened and given to the Applicant for Public Information, may harm the interests of foreign relations: 1. Position, bargaining power, and strategy that will be and has been taken by the state about international negotiations; 2. Diplomatic correspondence between countries; 3. Communication systems and coding used in carrying out international relations; and 4. Protection and security of Indonesia's strategic infrastructure abroad.
Public information which, if opened, can reveal the contents of an authentic deed that is personal and one's last will or will;
Public Information which, if opened and given to the Public Information Applicant, can reveal the secret, namely: 1. History and condition of family members; 2. History, condition, and treatment, treatment of one's physical and psychological health; 3. A person's financial condition, assets, income, and bank account; 4. Evaluation results related to capability, intellectuality, and recommendation of one's ability; and 5. Records concerning someone's relationship with the activities of formal education units and non-formal education units.
Memorandum or letters between public bodies or intern public bodies, which by their nature are kept confidential except at the decision of the Information Commission or court;
Information that may not be disclosed based on the law.

Compliance Checking

Compliance checking was done by comparing the information that was extracted from the Indonesian law number 14/2008 to its implementation to the current business process of BAWASLU RI particularly the process of updating and acquiring the public information. In the following section, we will first compare the type of information that should be issued, then the business process of acquiring public information and the last one is the business rules related to the data privacy and security.

- The Type of Information that Should be Published by the Public Agency

  The technique that was used in this section is making a checklist which is adapted from Table 24. The source to complete the checklist was acquired from the interview and analyze the

supporting document which is provided on their website http://ppid.bawaslu.go.id/ specifically the BAWASLU law (PERWASLU) number 1/2017[5].

Table 24. Checklist Type of Information BAWASLU RI

Type of Information	**Article 9**	**Check**
Information Obligated to be published and provided regularly	1. Every public sector must announce Public Information periodically.	✓
	2. Public Information as referred to in point (1) includes: a. Information relating to Public Sector; b. Information on the activities and performance of related Public Sector; c. Information on financial statements; and / or d. Other information regulated in legislation.	✓
	3. The obligation to provide and deliver Public Information as referred to in point (2) is carried out at least 6 (six) months.	✓
	4. The obligation to disseminate Public Information as referred to in point (1), shall be conveyed in a manner that is easily accessible to the public and easily understood language.	✓
	5. The methods referred to in point (4) are further determined by the Information Management and Documentation Officer in the relevant Public Agency.	✓
	6. Further provisions regarding the obligation of the Public Agency to periodically provide and deliver Public Information as referred to in point (1), point (2) and point (3) shall be regulated by the Information Commission's Technical Guidelines.	✓
Information obligated to be published necessarily	**Article 10**	
	1. Public bodies must announce immediately information that can threaten the lives of many people and public order.	Partially published, it depends on the type of the information which is referred to the law in chapter V

[5] https://ppid.bawaslu.go.id/regulasi/perbawaslu-nomor-1-tahun-2017-0

	2. The obligation to disseminate Public Information as referred to in point (1) shall be conveyed in a manner that is easily accessible to the public and in easily understood language.	✓
information obligated to be provided at any time	**Article 11**	
	1. The Public Agency is obliged to provide Public Information at any time which includes: a. List of all Public Information under its control, excluding excluded information; b. The results of the decision of the Public Agency and its considerations; c. All existing policies and supporting documents; d. The project work plan includes estimates of annual expenditures of the Public Agency; e. Public Agency agreements with third parties; f. Information and policies submitted by Public Officials in meetings that are open to the public; g. Work procedures for employees of Public Bodies relating to community services; and/or. h. Report on services for accessing Public Information as stipulated in this act.	✓
	2. Public Information that has been declared open to the community based on the complaint's mechanism and dispute resolution as referred to in Article 48, Article 49, and Article 50 is stated as Public Information that can be accessed by Users of Public Information.	Refer to the law
	3. Further provisions regarding the procedures for implementing the obligations of Public Agencies to provide Public Information that can be accessed by Users of Public Information as referred to in point (1) and point (2) are regulated by the Information Commission's Technical Guidelines.	✓
	Article 12	
	Every year the Public Agency must announce information services, which include: a. Number of requests for information received; b. The time required by the Public Agency to fulfill every request for information; c. Number of giving and rejecting requests for information; and d. Reasons for refusing information requests.	✓
	Article 13	
	1. To realize a fast, appropriate, and simple service for every Public Agency:	✓

	a. Appoint an Information Management and Documentation Officer; and b. Make and develop a system of providing information services quickly, efficiently, and somewhat by the technical guidelines for public information service standards that apply nationally.	
	2. The Information and Documentation Management Officer as referred to in point (1) letter a is assisted by functional officials.	✓
	Article 16	
	Public information that must be provided by non-government organizations in this Law are: a. Principle and purpose; b. Organization programs and activities; c. Name, address, management structure, and changes; d. Management and use of funds originating from the State Revenue and Expenditure Budget and Regional Revenue and Expenditure Budget, community contributions, and/or foreign sources; e. Mechanism of organizational decision making; f. Organizational decisions; and g. Other information stipulated by legislation.	✓

- Comparing the Data Privacy and Security

  This stage was done by providing the list of business rules extracted from the Indonesian law number 14/2008-chapter V article 17th next to the rules that implemented in BAWASLU RI. The implemented rules in BAWASLU RI refer to the BAWASLU law (PERWASLU) number 1/2017.

Table 25. Comparing the Data Privacy and Security of BAWASLU RI

De Facto	**De Jure**
Public Information which if opened and given to Public Information Applicants can hamper the law enforcement process, namely information that can:	Public Information that interferes with the process of prevention, handling violations, and resolving disputes, namely information that can hinder the process of monitoring and tracking violations of elections; (PERWASLU No 1/2017 Article 21st point a)
1. Inhibiting the process of investigating and investigating a crime;	Public Information that interferes with the process of prevention, handling violations, and resolving disputes, namely information that can hinder the process of monitoring and tracking violations of

	elections; (PERWASLU No 1/2017 Article 21st point a)
2. Disclose the identity of the informant, reporter, witness, and victim who is aware of a crime;	Public Information that reveals the identity of informants, reporters, witnesses, and victims who know of any criminal acts or Election Violations; (PERWASLU No 1/2017 Article 21st point b)
3. Disclose criminal intelligence data and plans relating to the prevention and handling of all forms of transnational crime;	Does not include to the scope of BAWASLU RI
4. Endanger the safety and life of law enforcers and their families; and/or	Public information that endangers the safety and life of Election Supervisors and their families; (PERWASLU No 1/2017 Article 21st point c)
5. Endanger the security of law enforcement equipment, facilities, and infrastructure.	Public information that endangers the security of equipment, facilities, and infrastructure of Election Supervisors; (PERWASLU No 1/2017 Article 21st point d)
Public Information which if opened and given to the Public Information Applicant may interfere with the interests of protection of intellectual property rights and protection from unfair business competition;	Does not include to the scope of BAWASLU RI
Public Information which, if opened and given to the Applicant for Public Information, could endanger national defense and security, namely: 1. Information about strategy, intelligence, operations, tactics and techniques relating to the implementation of the state defense and security system, including the stages of planning, implementation, and termination or evaluation in connection with domestic and foreign threats; 2. Documents that contain strategies, intelligence, operations, techniques and tactics relating to the implementation of a state defense and security system which includes the stages of planning, implementation, and termination or evaluation; 3. The number, composition, disposition, or dislocation of the strength and	Does not include to the scope of BAWASLU RI

capability in the implementation of the state defense and security system and its development plan; 4. Pictures and data about the situation and circumstances of bases and military installations; 5. Estimates of military and defense capabilities of other countries are limited to all actions and indications of the country which could endanger the sovereignty of the Unitary State of the Republic of Indonesia and/or data related to military cooperation with other countries as agreed as confidential or very secret; 6. State coding system; and/or 7. State intelligence system.	
Public information which if opened and given to the Public Information Applicant can reveal Indonesia's natural wealth;	Does not include to the scope of BAWASLU RI
Public information which, if opened and given to the Applicant for Public Information, could harm the resilience of the national economy: 1. The initial plan of buying and selling national or foreign currencies, shares and vital assets of the state; 2. The initial plan for changes in exchange rates, interest rates, and operating models of financial institutions; 3. An initial plan for changes in bank interest rates, government loans, changes in taxes, tariffs, or other states / regional income; 4. An initial plan of sale or purchase of land or property; 5. Initial foreign investment plan; 6. Process and results of supervision of banking, insurance, or other financial institutions; and/or 7. Matters relating to the process of printing money.	Does not include to the scope of BAWASLU RI
Public Information which, if opened and given to the Applicant for Public Information, may harm the interests of foreign relations:	Does not include to the scope of BAWASLU RI

1. Position, bargaining power, and strategy that will be and has been taken by the state about international negotiations; 2. Diplomatic correspondence between countries; 3. Communication systems and coding used in carrying out international relations; and/or 4. Protection and security of Indonesia's strategic infrastructure abroad.	
Public information which, if opened, can reveal the contents of an authentic deed that is personal and one's last will or will;	Does not include to the scope of BAWASLU RI
Public Information which, if opened and given to the Public Information Applicant, can reveal the secret, namely: 1. History and condition of family members; 2. History, condition, and treatment, treatment of one's physical and psychological health; 3. A person's financial condition, assets, income, and bank account; 4. Evaluation results related to capability, intellectuality, and recommendation of one's ability; and 5. Records concerning someone's relationship with the activities of formal education units and non-formal education units.	Public information that reveals the secrets of positions; (PERWASLU No 1/2017 Article 21st point e)
Memorandum or letters between public bodies or intern public bodies, which by their nature are kept confidential except at the decision of the Information Commission or court;	Public information that divulges the memorandum or internal letters of the BAWASLU and Provincial Election Supervisory Board except based on the decision of the Information Commission or the Judiciary is stated as information that can be published; (PERWASLU No 1/2017 Article 21st point f)
Information that may not be disclosed based on the law.	Public information that divulges information that is prohibited to be disclosed based on legislative provisions. (PERWASLU No 1/2017 Article 21st point g)

- Business Process Matching

  Business process matching was done by comparing each step described in the two models of acquiring public information (see Figure 13 and Figure 15). The comparison concludes that BAWASLU RI has already implemented the business process entirely as described in the regulation. Even though the model from BAWASLU does not depict the type of notification as stated in the Indonesian law no 14/2008 article 22, the undefined type of the notification can be found in the document namely the responsibility of BAWASLU RI to applicants. The document can be accessed on their website[6]. The translation of the document is available in Appendix D.

Post-Audit

Recommendation

After following the steps in the information triangle particularly for the pre-audit and audit stage, the study comes to those findings:

a. BAWASLU RI provides almost all information that should be published by the Indonesian law. There is only one type of information that could not be published completely due to concerning the privacy of the information. The type of information is regulated in article 10 point 1 which mention "Public bodies must announce immediately information that can threaten the lives of many people and public order.". BAWASLU should refer the request of this kind of information to the Indonesian law chapter V.
b. Regarding the business rules that related to the data privacy and security, BAWASLU RI does not employ the complete rules from the Indonesian law no 14/2008. From the 17 columns of business rules from Indonesian law, only eight columns that can be matched with the PERWASLU. This condition happened since the Indonesian law no 14/2008 was designed generally for all companies in Indonesia, state or private. Therefore, BAWASLU carefully selected the business rules from Indonesian law which are suitable with the context or the primary task of BAWASLU.
c. The business process of acquiring public information in BAWASLU RI has fully adapted to the business process from the Indonesian law number 14/2008 particularly chapter VI. In other words, based on the regulation, there is no deficiency in its business process.

In conclusion, BAWASLU has correctly implemented the Indonesian law number 14/2008 to their business process and business rules. It is seen that the system, regulation, and procedures are complete. Also, there is an alignment between the result of the interview and the result of analysis of the current system and information. Therefore, there is no suggestion about the changes to BAWASLU RI. The study only suggests keeping doing the excellent work on maintaining the system of requesting the public information.

[6] https://ppid.bawaslu.go.id/hak-dan-kewajiban-bawaslu-dalam-pelayanan-informasi

Lesson Learned

This section describes the challenges and experiences that researcher faced during the audit process that is explained in the following list:

1. The process of requesting permission to research a governmental organization is much longer than state companies since its bureaucracy process. Therefore, the auditor should arrange the permission request in advance hence the process of the audit can be carried out in time optimally.
2. The process of acquiring data is more effective and less time consuming than the first case study since the process of the interview have been improved from the first case in RSAI.
3. The overall audit process is faster than the first case since BAWASLU has proper documentation for their business process and other supported document.

5.4. What We Achieved?

After implementing the information audit triangle in two companies in Indonesia, the study leads to the following findings:

- The analysis of the business objectives with the information provided could not be entirely included since the two companies do not elaborate on the business objectives of the department. Therefore, it is quite challenging to do the measurement with the information resources.
- The framework can be implemented well in two companies which have different business sector and different services. The first company is a hospital, a private sector which focuses on human service while the second company is a public sector which focuses on the supervise the sustainability of the election.
- The implementation of this framework validates a company whether they have successfully implemented the regulation. Furthermore, the framework can be utilized to look for the deficiency of the implementation of the regulation.
- The challenges and audit experiences from each case were collected as the lesson learned that could be used to improve the framework. In other words, the implementation shows the flaws of the framework such as the incomplete process in the audit component.

5.5. What We Improved?

According to the lesson learned from each case, there is only one thing that can be improved from this framework is that the practitioners have to make sure to understand the reference of regulation or standardization to data collection. The study considered this deficiency after implementing the framework in the first company (RSAI). After ensuring this into consideration in the implementation to the second company, the process of auditing can be carried out efficiently.

CHAPTER 6 - Conclusion and Future work

The section consists of the conclusion of the research, the discussion of the result, limitations, and the process of carrying out the study. The last part of this section then explores several recommendations for future researches.

6.1. Conclusions

The study successfully developed an information audit framework which is called as the information audit triangle. The development processes in this thesis followed the steps in DSRM by Peffers et al. (2008). This section will explain how the study answers the research questions which are elaborated in section 1.4. The main question of this research will be answered followed by the sub-questions that are related to the answer to the main question.

Main Question: "How to develop a generally applicable information audit framework for practitioners based on the existing domain specific information audit frameworks in the scientific literature?"

The main question was answered in Chapter 3 and Chapter 4. The primary process of developing the framework was described in Chapter 4. However, the result of a systematic literature review in Chapter 3 provides the background information that is needed to start developing the artifact.

SQ1: What aspects should be covered in the information audit framework?

The study answered this question in Chapter 3 (see section 3.6, Table 9). Based on the table, four aspects should be covered in an Information Audit framework, business process, compliance checking, monitor, and security. Therefore, these aspects were referred in the artifact that was developed in this study. The three aspects, business process, compliance, and security are included in the audit stage of information audit triangle while the monitor is included in the post-audit stage.

SQ2: How generally applicable the framework in practice?

According to the result of the implementation of the framework in Chapter 5, despite several deficiencies in the application of several processes in the framework, the information audit triangle can perform well in two different business sector and environment. Additionally, the result in this thesis shows that most of the process can be followed by the practitioner, in this study represented by the researcher.

SQ3: How to evaluate the usage of the framework in an organization?

The evaluation of the artifact was performed by doing the case study that implemented the artifact in two companies in Indonesia. From each case study, the research found its difficulty and challenges and the study mentioned them as the lesson learned. The lesson learned then used to evaluate which process that should be improved and could not be performed.

6.2. Discussion and Limitations

This thesis was motivated by one of the conclusions drawn in the systematic literature review to find the trend of information audit. The conclusion that is initiated the thesis is about the lack of information audit that can be used generally. Therefore, this study attempts to fill in the gap of the existing framework. From this literature review, there are 6 information audit frameworks acquired, (i) INFOAuditor (Wattiau, Akoka, 1997) (ii) ElCIA by (Drus et al., 2008) (iii) LSAM framework (Wu & Qu, 2009) (iv) Information Audit for IT compliance (Kim, 2011) (v) Security Audit for e-government (Bing & Bo, 2014) (vi) Implementation of COBIT (Tingliao, 2016). These frameworks are utilized as the background information to develop the artifact. However, during the process of developing the framework, the study excluded one of the frameworks, INFOAuditor, since the study does not provide sufficient information and it is merely defined the procedure to use the audit application. In addition, the study added one framework considering its suitability with the topic of the thesis. The framework is SMART Auditing by (Bukhsh, 2015). Hence the total of framework references does not change, six with SMART Auditing as the additional reference. Concerning the components selected in the framework, the reason and justification are elaborated in section 4.1.3 The components are selected based on the general function of the processes.

After the development, then the study moved to the evaluation stage. The validation only is carried out in two companies in Indonesia. Due to the time constraint, the scope of the audit focus one business process for each company and refer to one regulation. The validation also can only be performed until the report the audit result.

Regarding the tools used in the implementation of Information Audit, the study chose a checklist, and BPMN considering the contains of the regulation that was used as the instrument of the audit. Also, based on the analysis to the business process explained in the regulations, both of them are referred to the high-level system design which is specialized to the BPMN (Dijkman, Dumas, & Ouyang, 2008). While for the checklist, Kim (2011) suggested in to develop the checklist as the audit instrument. Hence, the study utilized the checklist to check the type of information and business rules. The checklist also helped the researcher to add the reference or supported document that refers to the implementation to the current business.

6.3. Future Work

This section provides recommendations that can be addressed by researchers who follow this thesis. The directions for future work are listed below:

a. The current model of information audit triangle provides the techniques from each component of the framework. However, the techniques provided in the description are still limited. Exploring more technique that can be applied in the information audit triangle might help the practitioner to choose the best technique which is suitable for their case.
b. The evaluation process of this thesis focuses only on the eligibility of each process in the information audit triangle while the other instrument such as document needed in the input for each component, questionnaire, and the checklist has not been evaluated comprehensively. The

future work of assessing the instrument of the audit could optimize the performance of the framework.

c. The evaluation of the framework can be applied in more than two companies or implement the framework in the different business sector or environment. Hence, the future study will have more insight to improve the framework based on the various challenges that might be faced by the researchers.
d. The input from the expert might be the option for adding value to the evaluation process of the framework.

These recommendations might be considered by the researchers who are willing to improve or evaluate the process of this study.

References

Anastopoulos, V., & Katsikas, S. (2016, September). Design of a Log Management Infrastructure Using Meta-Network Analysis. In *International Conference on Trust and Privacy in Digital Business* (pp. 97-110). Springer, Cham. https://doi.org/10.1007/978-3-319-44341-6

Andrade, J. M., Prada, D., Muniategui, S., & Firpo, G. (1994). A practical approach to auditing LIMS in laboratories involved with ISO quality assurance systems. *Chemometrics and intelligent laboratory systems*, *26*(1), 13-26. https://doi.org/10.1016/0169-7439(94)90014-0

Ariffin, I., Latif, A. A., Faudzi, M. A., Shariff, S. S., & Nadzir, M. M. (2014, June). Information audit in electricity utilities: Roles, methodologies, issues and challenges. In *Computer and Information Sciences (ICCOINS), 2014 International Conference on* (pp. 1-6). IEEE. https://doi.org/10.1109/ICCOINS.2014.6868421

Bacigalupo, R., Fox, N., & Levy, P. (2005). Information management in health visitors' public health and community development activities. *Health Informatics Journal*, *11*(2), 83–94. https://doi.org/10.1177/1460458205050680

Bing, H., & Bo, W. (2014). Research of Intranet Security Audit in E-government Management Website Group Based on Multi-agents. In *Advances in Computer Science and its Applications* (pp. 893-899). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41674-3

Botha, H., & Boon, J. A. (2003). The information audit: principles and guidelines. *Libri*, *53*(1), 23-38. https://doi.org/10.1515/LIBR.2003.23

Buchanan, S., & Gibb, F. (1998). The information audit: an integrated strategic approach. *International journal of information management*, *18*(1), 29-47. https://doi.org/10.1016/S0268-4012(97)00038-8

Buchanan, S., & Gibb, F. (2007). The information audit: Role and scope. *International journal of information management*, *27*(3), 159-172. https://doi.org/10.1016/j.ijinfomgt.2007.01.002

Buchanan, S., & Gibb, F. (2008). The information audit: Methodology selection. *International journal of information management*, *28*(1), 3-11. https://doi.org/10.1016/j.ijinfomgt.2007.10.002

Buchanan, S., & Gibb, F. (2008). The information audit: Theory versus practice. *International Journal of Information Management*, *28*(3), 150–160. https://doi.org/10.1016/j.ijinfomgt.2007.09.003

Bukhsh, F. A. (2015). Smart auditing: Innovative compliance checking in customs controls. *Tilburg: CentER, Center for Economic Research.*

Burk, C. F., & Horton, F. W. (1988). Infomap: a complete guide to discovering corporate information resources. In *InfoMap: a complete guide to discovering corporate information resources*. Prentice Hall.

Cortez, E. M. (1999). Research, education, and economics information system: an engine for strategic planning and information policy development at the US Department of Agriculture. *Journal of government information*, *26*(2), 119-129. https://doi.org/10.1016/S1352-0237(99)00005-2

Daghfous, A., & Khawaja, A. S. (2010, June). Knowledge-enabled SCM auditing (K-SCM): a methodology and a case illustration. In *Management of Innovation and Technology (ICMIT), 2010 IEEE International Conference on* (pp. 964-969). IEEE. https://doi.org/10.1109/ICMIT.2010.5492867

Dalibor, D., & Branko, L. (2016). Frameworks for Audit of an Information System in Practice. *JITA Journal of Information Technology and Applications, 6(12).* 78-85. https://doi.org/10.7251/JIT1602078D

Dijkman, R. M., Dumas, M., & Ouyang, C. (2008). Semantics and analysis of business process models in BPMN. *Information and Software technology*, *50*(12), 1281-1294. https://doi.org/10.1016/j.infsof.2008.02.006

Dimond, G. (1996). The evaluation of information systems: a protocol for assembling information auditing packages. *International Journal of Information Management*, *16*(5), 353-368.

Drus, S. M., & Shariff, S. S. M. (2008). ElCIA: Integrated Information Audit Framework for Electricity Companies. *Universiti Tenaga Nasional*.

Ellis, David, R. Barker, Susan Potter, and Cheryl Pridgeon. "Information audits, communication audits and information mapping: A review and survey." *International Journal of information management* 13, no. 2 (1993): 134-151. https://doi.org/10.1016/0268-4012(93)90079-J

Evan-Wong, S., & de Freitas, C. (1995). Marketing an information service: a case study of the OECS economic affairs secretariat documentation centre. *Information services & use*, *15*(2), 117-130. https://doi.org/10.3233/ISU-1995-15204

Fei, Y., Yue, S., Ji-yao, A., Ling-fen, Z., & Miao-liang, Z. (2006). Information audit based on image content filtering. *Wuhan University Journal of Natural Sciences*, *11*(1), 234-238. https://doi.org/10.1007/BF02831738

Frost, R. B., & Choo, C. W. (2017). Revisiting the information audit: A systematic literature review and synthesis. *International Journal of Information Management*, *37*(1), 1380-1390. https://doi.org/10.1016/j.ijinfomgt.2016.10.001.

Fu, X., & Zhang, X. (2009). A synthetical information audit of a Chinese operator practical study. In *4th International Conference on Cooperation and Promotion of Information Resources in Science and Technology, COINFO 2009* (pp. 9–15). IEEE. https://doi.org/10.1109/COINFO.2009.58

Ganasan, A. (2011, November). Knowledge audit made comprehensive thru 6 stages. In *Research and Innovation in Information Systems (ICRIIS), 2011 International Conference on* (pp. 1-6). IEEE. https://doi.org/10.1109/ICRIIS.2011.6125730

Gourova, E., Antonova, A., & Todorova, Y. (2009). Knowledge audit concepts, processes and practice. *WSEAS Transactions on Business and Economics*, *6*(12), 605-619.

Henczel, S. (2001). The information audit : a practical guide. *De Gruyter*

Henczel, S. (2006). Measuring and evaluating the library's contribution to organisational success: Developing a strategic measurement model. *Performance Measurement and Metrics*, *7*(1), 7-16. https://doi.org/10.1108/14678040610654819

Jones, A., Mutch, A., & Valero-Silva, N. (2013). Exploring information flows at nottingham city homes. *International Journal of Information Management*, *33*(2), 291-299. https://doi.org/10.1016/j.ijinfomgt.2012.11.012

Kim, S. (2011). Auditing methodology on legal compliance of enterprise information systems. *International Journal of Technology Management*, *54*(2/3), 270-287. https://doi.org/10.1504/IJTM.2011.039315

Lankhorst, M. (2009). *Enterprise architecture at work: Modelling, communication and analysis*. Springer Science & Business Media.

Levantakis, T., Helms, R., & Spruit, M. (2008, November). Developing a reference method for knowledge auditing. In *International Conference on Practical Aspects of Knowledge*

Management (pp. 147-159). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-89447-6_15

Liu, S., Wei, J., & Wang, S. (2012, December). Efficiently Identifying Duplicated Chinese Company Names in Large-Scale Registration Database. In *International Conference on Advanced Data Mining and Applications* (pp. 625-634). Springer, Berlin, Heidelberg.

Mateescu, R. (2002, April). Local model-checking of modal mu-calculus on acyclic labeled transition systems. In *International Conference on Tools and Algorithms for the Construction and Analysis of Systems* (pp. 281-295). Springer, Berlin, Heidelberg.

Menteri Kesehatan Republik Indonesia. Permenkes RI no 269/Menkes/Per/III/2008, Rekam Medis (2008). Indonesia.

Nath, H. K. (2017). The Information Society. In *Space and Culture*, 19–28. India http://dx.doi.org/10.20896/saci.v4i3.248

Orna, E. (1999). *Practical information policies*. Gower Publishing, Ltd.

Peffers, K., Tuunanen, T., Rothenberger, A. M., & Chatterjee, S. (2008). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, *24*(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

PERATURAN BADAN PENGAWAS PEMILIHAN UMUM (2017). Indonesia.

Roberts, S. A. (2008, November). Recording knowledge-related activities in practice: Methodological bases and a method of knowledge auditing. In *Aslib Proceedings* (Vol. 60, No. 6, pp. 583-599). Emerald Group Publishing Limited. https://doi.org/10.1108/00012530810924285

Rus, I. (2015). Technologies and Methods for Auditing Databases. *Procedia Economics and Finance*, *26*(15), 991–999. https://doi.org/10.1016/S2212-5671(15)00921-1

Shahmoradi, L., Ahmadi, M., Sadoughi, F., Piri, Z., & Gohari, M. R. (2015). A comprehensive model for executing knowledge management audits in organizations: A systematic review. *Health Care Manager*, *34*(1), 28–40. https://doi.org/10.1097/HCM.0000000000000046

Shahmoradi, L., Karami, M., & Nejad, A. F. (2016). Auditing knowledge toward leveraging organizational IQ in healthcare organizations. *Healthcare Informatics Research*, *22*(2), 100–119. https://doi.org/10.4258/hir.2016.22.2.110

Shariff, S. S. M., Ariffin, I., Latif, A. A., & Nadzir, M. M. (2013). A preliminary evaluative study of the ElCIA: Integrated Information Audit framework for electricity companies. In *International Conference on Research and Innovation in Information Systems, ICRIIS* (pp. 386–391). https://doi.org/10.1109/ICRIIS.2013.6716741

Sukiam, A. S., Rahman, A. A., & Abidin, W. Z. (2008, December). Knowledge audit on special children communities. In *Pacific Rim Knowledge Acquisition Workshop* (pp. 198-207). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-01715-5_17

Tang, J., Liang, D., Wang, N., & Jia, Z. H. (2007, December). Spectral correspondence using local similarity analysis. In *Computational Intelligence and Security, 2007 International Conference on* (pp. 395-399). IEEE. https://doi.org/10.1109/CIS.2007.211

Thomas, G. (2017). *How to Do Your Research Project: A Guide for Students*. Sage.

Tingliao, L. (2016, January). The IT audit research based on the information system success model and COBIT. In *Intelligent Systems and Control (ISCO), 2016 10th International Conference on* (pp. 1-3). IEEE. https://doi.org/10.1109/ISCO.2016.7727117

UNDANG-UNDANG REPUBLIK INDONESIA (2008). Indonesia.

Wang, B., & Yang, Y. (2008, June). Acquisition and visualization of sensitive security audit events. In *Information and Automation, 2008. ICIA 2008. International Conference on* (pp. 1514-1519). IEEE. https://doi.org/10.1109/ICINFA.2008.4608243

Wattiau, I. C., & Akoka, J. (1997). Expert systems for computer and management information systems auditing. *Computer Audit Update*, *1997*(9), 17-27. https://doi.org/10.1016/S0960-2593(97)81181-0

Wu, J., & Qu, K. (2009, September). Research and realization of secure audit mechanism based on LSM. In *Management and Service Science, 2009. MASS'09. International Conference on*(pp. 1-5). IEEE. https://doi.org/10.1109/ICMSS.2009.5304261

Xiao, J., & Wang, J. (2010, June). Enterprise knowledge management audit based on processes: Toward an integrated conceptual framework. In *Management of Innovation and Technology (ICMIT), 2010 IEEE International Conference on* (pp. 940-945). IEEE.

Yu, F., Huang, H., Xu, C., Dai, X. P., & Zhu, M. L. (2005, November). Badness information audit based on image character filtering. In *International Symposium on Parallel and Distributed Processing and Applications* (pp. 647-656). Springer, Berlin, Heidelberg. https://doi.org/10.1007/11576259_70

Yu, F., Shen, Y., Huang, H., Xu, C., & Dai, X. P. (2006). An information audit system based on bayes algorithm. In *Asia-Pacific Web Conference* (pp. 869-876). Springer, Berlin, Heidelberg. https://doi.org/10.1007/11610496_120

Zwijze-Koning, K. H., & De Jong, M. D. (2005). Auditing information structures in organizations: A review of data collection techniques for network analysis. *Organizational Research Methods*, *8*(4), 429-453. https://doi.org/10.1177/1094428105280120

Appendix A

Table 26. Information Audit Literature Review

No	Title	Author	Year	Description	Method	Framework	Technique	Type	The reason	Domain
1	A comprehensive model for executing knowledge management audits in organizations	Leila Shahmoradi, Maryam Ahmadi, Farahnaz Sadoughi, Zakieh Piri, Mahmood Reza Gohari	2015		They collected methods from 24 studies on KMA			Research	They would like to create a comprehensive model for doing KMA	N/A
2	A Multi-Pattern Matching Algorithm on Multi-Language Mixed Texts for Content-Based Network Information Audit	Qin-dong Sun, Qian Wang, Xin-bo Huang	2007				Multi-Pattern Matching Algorithm	Practice	This technique is used in content-based network information audit to process multi-language mixed test. The algorithm also proved can avoid the mismatch in the mixed test.	Monitor
3	A Practical approach to auditing LIMS in laboratories involved with ISO quality assurance systems	J.M. Andrade, D. Prada, S. Muniategui, G. Firpo	1994	They audit the LIMS (Laboratory Information Management System) and adopt the process of computer audit by Doherty (1990) which has 3 phases, check the current doc, validation, and process the findings.	Computer Audit by Doherty (1990)			Research	They do the audit process to check the current documentation and test the model.	Monitor
4	A preliminary evaluative study of the ElCIA	Siti Salbiah Mohammad Sharrif, Isyana	2013	Evaluate the ElCIA framework		ElCIA		Practice		Business Process

	Integrated Information Audit framework for electricity companies	Arifin, Aliza Abdul Latif, Mawaddah Mohamad Nadzir								
5	A Synthetical Information Audit of a Chinese Operator Practical Study	Xingling Fu, Xiaoyang Zhang	2008	This is a report of Information Audit in a telecommunication company.	Combining method from Burk & Horton, Oran, Buchanan & Gibb, Henczel			Practice		Business Process
6	Acquisition and visualization of sensitive security audit events	Baoyun Wang, Yingie Yang	2008	The paper defines a framework for sensitive security audit events supported by DWT and DBSCAN. They also visualize the event process by Petri-Net			DWT (discrete wavelete transformation) and DBSCAN ((density-based spatial clustering of application with noise)	Practice	The framework is utilized for sensitive security audit events. DWT is used for selecting the sensitive object while the DBSCAN for clustering the object based the time distance.	Security
7	An Information Audit System Based on Bayes Algorithm	Fei Yu, Yue Shen, Huang Huang, Cheng Xu, Xia-page Dui	2006	They performed a network information audit to check the badness information through the text.			Bayes Algorithm	Practice	Bayes Algorithm is used for expressing the text, help machine to read the text. So, they can get a better result when filtering the text.	Monitor
8	Auditing Information Structures in Organisations: A Review of Data Collection Techniques for Network Analysis	Karen H. Zwijze-Koning, Menno D. T. De Jong	2005	The paper defines some technique of data collection on network analysis particularly in communication audit			Sociometric Questioning, Diary Research, Observation Research, Analysis of Archival Records, ECCO Analysis, Small-World Technique	Practice		Monitor
9	Auditing knowledge toward Leveraging	Lella Shahmoradi, Mahtab	2016	Auditing the knowledge management of the Ministry of Health and	Does not mention one specific name of			Practice		Business Process

	Organisational IQ in Healthcare Organisations	Karami, Ahmadreza Farzaneh Nejad		Medical Education (MOHME) of Iran and relating the result to the OIQ (Organisational intelligence quotient)	the method (Interview, Observation, Questionnaire)					
10	Auditing Methodology on legal compliance of enterprise information system	Sangkyun Kim	2011	IT auditing which is focused on its enterprise information system		Auditing Methodology for Enterprise Information System		Research	They made this framework particularly for auditing the IT compliance	Compliance
11	Badness Information Audit Based on Image Character Filtering	Fei Yu, Huang Huang, Cheng Xu, Xiao-peng Dai, Miao-Liang Zhu	2005	The process of information audit by implementing the image character filtering			Image Character Filtering	Research	Image character filtering is used to supervise the badness of image content by implementing image segmentation.	Monitor
12	Building an integrated school management information system - a case study from Germany	Angelina Lange and Andreas Breiter	2009	Analysis of Information needs is mentioned as one of the steps needed to build the integrated system	Interview and Group discussion			Practice	They analyze to create a basic understanding of the current the processes and improve the quality of their decisions	Business Process
13	Design of a Log Management Infrastructure Using Meta-Network Analysis	Vasileios Anastopoulos, Sokratis Katsikas	2016	Method to validate the data log		Log Data Collection Framework (It is not a framework from this paper)	Meta-Network Analysis	Research		Compliance
14	Developing a Reference Method for Knowledge Auditing	Theodore Levantakis, Remko Helms, Marco Spruit	2008	A list of the reference method for knowledge and information audit	orna, henczel, Burnett, Perez-Soltero, Cheung, A new method proposed by authors			Research		N/A

15	Efficiently Identifying Duplicated Chinese Company Names in Large-Scale Registration Database	Shaowu Liu, Jiyong Wei, Shouwei Wang	2012	The implementation of Judging Duplicate Method for identifying the duplicate Chinese company name	Method of Judging Duplicate			Research	The method is feasible and effective in solving the company name duplicate detecting problem in the massive data environment.	Monitor
16	ElCIA: Integrated Information Audit Framework for Electricity Companies (Additional)	Drus, Sulfeeza Mohd; Salbiah, Siti; Shariff, Mohamed	2008	The description of ElCIA Framework	Risk-based approach	ElCIA		Practice	They propose a framework that fits into the electricity company's environment	Business Process
17	Enterprise knowledge management audit based on processes: Toward an Integrated Conceptual Framework	Xiao Jiuling, Wang Jiankang, Peng jisheng	2010	A study which reviews some methods in knowledge management audit.	FKM-Audit, KMAT, KMMM, HyA-K-Audit, KAA, SEKAM	Knowledge Management Audit Based on Processes		Research	They propose a framework that can be a guideline for the practices.	Business Process
18	Expert Systems for Computer and Management Information Systems Auditing	Isabelle Comn	1997	They made an expert system on information system audit called INFAUDITOR		INFOAUDITOR framework		Research	They made this framework as a prior action to make criteria for developing the expert system of the Information System Audit	Business Process
19	Exploring information flows at Nottingham City Homes	Alice Jones, Alistair Mutch, Nestor Valero-Silva	2012	The result of an information audit in the public sector area	Buchanan & Gibb Method			Practice	The approach is helpful to identify the importance of both information inventory and process-based flow analysis	Business and Compliance

20	Information Audit Based on Image Content Filtering	Yu Fei, Shen Yue, An Ji-Yao, Zhang Ling Fen	2006	Describe the process of image content filtering			Image Content Filtering	Practice	This technique is used to filter the badness information which is embedded in a picture.	Monitor
21	Information audit in electricity utility roles, methodologies, issues, and challenges	Izyana Ariffin, Aliza Abd Latif, Masyura Ahmad Fauzi, Siti Salbiah Shariff, Mawaddah Mohamad Nadzir	2014	Giving an overview of the IA implementation in the electricity company	Buchanan & Gibb Method, Orna, Henczel	ElCIA		Practice	These methods are suitable to implement in a large organization	Business Process
22	Information Audit: Keys for understanding the academic library	Rebekah Kilzer	2012	Implementation of information audit in the academic library, the method does not mention clearly. They put the concept of IA in some domain in academic libraries such as understanding communication patterns, succession planning, documentation practices, preparing for change, strategic planning, and service evaluation				Research		Business Process
23	Information Audit: Towards common standards and methodology	Peter Griffiths	2012	The reviewed current issue in Information Audit. It does not mention the method, or others to support the IA process but it highlights the issues that occurred in IA and led to the common understanding of IA				Research		N/A

24	Information Audits, Communication Audits, and Information Mapping: A Review and Survey	D. Ellis, R Barker, S. Potter, C. Pridgen	1993	A systematic review of Technique and Method in IA, CA and Information Mapping	Cost-benefit methodologies, the geographical approach, hybrid approaches, Management Information Audit, Operational advisory audit		Gathering Information, System Analysis and Representation, System Evaluation, Testing	Research		N/A
25	Information management in health visitors' public health and community development activities	Ruth Bacigalupo, Nick Fox, Philippa Levy	2005	Implementing the concept of information audit in the information management of health visitors' public health.			NUD.IST for qualitative data analysis	Practice		Compliance
26	Intelligence audit: Planning and assessment of organizational intelligence systems	Andrea V. Carvalho, Miguel Esteban-Navarro	2016	Present a methodology in intelligence audit which includes information audit				Research		Monitor
27	Investigation on auditing and rules for PDM/PLM system implementation		2013	This paper mentions the computer audit as a part of auditing in their department.	In-depth interview					Monitor
28	Knowledge audit concepts, processes, and practice	Elissaveta Gourova, Albena Antonova, Yanka Todorova	2009	The paper tells the concept of KA first then give some approaches to support the process of KA then they came up with a new approach to do the KA	KMAT, KMD, KMMM, Fai et al. (8 steps of KA approach), Adaptive KA by Jurinjak		Scorecard, Direct Intellectual Capital, Return-on-assets, Market Capitalization Method	Research	The new approach offered by them is considered not only the explicit and tacit knowledge assets but also the internal and external factors for knowledge development.	N/A

29	Knowledge Audit Made Comprehensive thru 6 stages	AruntethyBai Ganasan, Dr. Dhanapal Durai Dominic P	2011	It is a comparative study between two methods of KA (KA methodology with Emphasis on Core Processes & Systematic Approach for knowledge Auditing)				Research and Practice	They propose stages of KA that can be implemented in a selected field of study, in this case, the Oil and Gas industry.	Monitor
30	Knowledge audit on special children communities	Aida Suzana Sukiam, Azizah Abdul Rahman, Wardah Zainal Abidin	2009	It is a report of information audit in special children communities. The authors adopted several methods proposed by the experts.	K-Need, K-Inventory, K-Flow, K-Mapping Analysis			Practice	These methods are selected due to its relevancy to the selected field, a community of practice.	Monitor
31	Knowledge-enabled SCM auditing (K-SCM): A Methodology and a Case Illustration	A. Daghfous, A. S. Khawaja	2010	They propose a KA framework for supply chain management. It is called K-SCM knowledge audit.		K-SCM Knowledge Audit			this framework is a combination between the KA process and Supply Chain Model	Business Process
32	Local Model-Checking of Modal Mu-Calculus on Acyclic Labeled Transition System	Radu Mateescu	2002	The papers describe algorithms implemented in Local Model Checking			Local Model-Checking	Research	The model-checking approach they proposed can be directly applied to other forms of trace analysis (e.g., run-time monitoring, security log file auditing, etc.) by encoding these problems as model-checking of temporal formulas on single trace Altss.	Monitor
33	Marketing an Information Service: A case study of the OECS Economic Affairs Secretariat	Sue Evan-Wong, Claudette de Freitas	1995	The information audit is one of the processes they do for making strategic planning. Therefore, only a little part of the literature that			SWOT Analysis, Budget Review, Usage Review	Practice		Business Process

	Documentation Centre			describes the process of IA.						
34	Recording knowledge-related activities in practice: Methodological bases and a method of knowledge auditing	Stephen A. Roberts	2008	Describe the relationship between Information audit and knowledge audit				Research	There is no method or technique described in this paper. The paper defines the concept of the knowledge audit only with give some narration for the components and process	N/A
35	Research and Realization of Secure Audit Mechanism Based on LSM	Wu Jie, Qu Kun	2009			LSAM (Linux security audit module)		Research and Practice	The framework consists of three modular, audit information collection module, an audit log management module, audit security early warning module. This framework is tested in a designed algorithm for audit log performance in Linux. The result showed that the framework leads to better security and running performance of the system	Security
36	Research of Intranet Security Audit in E-government Management Website Group Based on Multi-agents	Han Bing, Wang Bo	2014	The paper proposes a framework for doing a security audit in e-government		Security Audit Framework for e-government		Research	The framework has two domain, the data acquisition module, and an audit module. This framework focus on auditing the host data and network data by comparing both characteristics. They	Security

									also focus on data safety.	
37	Research, education, and economics information system: an engine for strategic planning and information policy development at the U.S. Department of agriculture	Edwin Michael Cortez	1999	The implementation of strategic information audit at US Department of Agriculture			Shadowing/Case Study Analysis, Audit Log	Practice	They use 3 phase of IA, Inventory, and Development of Database Catalogue, Identification, Documentation and Description, Organizing and Interpreting Data.	Business Process
38	Revisiting the Information Audit: A Systematic literature review and synthesis	Robert B. Frost, Chun Wei Choi	2017	A systematic literature review that addresses the current research trend in Information Audit				Research		N/A
39	Strategic Information Management: A Pilot Study in a Finnish Pharmaceutical Company	M-L Huotari	1995	An evaluation of information system which implements the concept of information audit.				Practice	they adopt the IA approach to get the information needed. They combine the information retrieved from the analysis with the CSF (critical success factor) which is described in a table.	Business Process
40	Technologies and Methods for Auditing Databases	Ioan RUS	2015	The paper describes the concept of database audit then propose a method for doing the database audit	Scoreboard Database Audit			Research	The approach is designed based on the seven characteristics of information defined in COBIT	Security
41	The evaluation of information systems: a protocol for	G Dimond	1995	Describes some techniques for information audit. The result of this study is a			Information Mapping, Combining SSM with CSF	Research		N/A

	assembling information auditing packages			protocol that is used to develop methodologies in IA			Analysis, Infomaps (Burk and Horton)			
42	The Generic Information Business Model	Evangelos Alexopoulos, Babis Theodoulidis	2003	They design an information business model that could handle many to many relationships and navigate to the steps of the audit	Combining method from Burk & Horton, Oran, Buchanan & Gibb, Henczel			Research		Business Process
43	The Information Audit: An Integrated Strategic Approach	S Buchanan and F Gibb	1998	Proposed a new methodology that covers the strategic role for the information	Universal Methodology			Research	They state that this method could be adopted to the wide and various environment	Monitor
44	The information audit: Methodology Selection	S Buchanan and F Gibb	2008	A review of existing methods	InfoMap, Orna's top-down approach, Buchanan top-down approach, Henczel Method			Research		N/A
45	The information audit: Role and Scope	S Buchanan and F Gibb	2007	this paper describes the fundamental concept of information audit. It does not mention either the methods, technique or frameworks but it gives a comprehensive explanation of the scope of IA.				Research		N/A
46	The information audit: Theory vs. Practice	S Buchanan and F Gibb	2008	The paper shows the result of usability testing of universal IA method by Buchanan and Gib. This study gives you an insight on how to implement the method in practice.			Cost/Value Analysis, Top-Down Strategic Analysis, Force Field Analysis	Practice		Monitor and Business

47	The IT audit research based on the information system model and COBIT	Li Tingliao	2016	Combining the model of IS Success by D&M and COBIT framework on performing the IS Audit.		COBIT		Research	The combination of this model complements the part that lacks from COBIT framework on IT Audit. The result of this combination gives a comprehensive and systematic information quality and using impact, combined with the actual situation of the business objective to evaluate information system.	Compliance
48	The organization of organizational knowledge	Danny Budzak	2013	Describing some methods and approaches of the Information Services			PEST analysis, STRIM modeling, Force Field Analysis	Research		Business Process
49	Towards a Virtualization-enabled Framework for Information Traceability (VFIT)	Ravi Sahita, Uday Savagaonkar	2008	Describe a framework that can be used to support the information traceability, securely tracing information exchanged across a network of such systems.		Virtualization-enabled Framework for Information Traceability			Could this framework be included for IA? The purpose of this framework is to monitor the information usage.	Monitor
50	Using Integrated System Theory Approach to Assess Security for SCADA Systems Cyber Security for Critical Infrastructure: A Pilot Study	Suhaila Ismail, Elena Sitmikova, Jill Slay	2014	The paper does not mention the process of IA otherwise give a number on the awareness of Company which implement the information audit to support the security scheme				Research		Security

51	Where next for information audit?	Peter Griffiths	2010	Giving a discussion for several perspectives of IA in different fields.				Research		N/A

Appendix B

Questionnaire

Pre-Audit Questionnaires

The aim of the questionnaire is to check whether the framework of information audit is applicable in an organisation or not. These questions are asked before performing the information audit.

1. **General Question**
    1. What is your position within company?
    2. What is the main task/responsibility of your job?
    3. Do you receive your job description or you have to explore your job description?
2. **Questions Focused on the knowledge of Information Audit**
    1. Are you familiar with the field information audit?
    2. Have your company conduct the information audit before?
    3. What do you expect from the result of information audit?
    4. Is your company willing to share (to some extent) the business documentation required for supporting our study?
    5. Do you believe that information audit can benefit your company for optimising its performance?
    6. Do you think information audit is important and should be done within company?
3. **Questions to Business (To what extend the company ready to perform the information audit)**
    1. What are the main business processes within the company?
    2. What are the main business processes within your department?
    3. Is your company have objective documentation?
    4. Is your department have objective documentation?
    5. Is there any documentation which shows the business process within the company or department?
    6. are the information flows within your company are documented?
    7. If the documentation exists, what type of document that you use for recording the information flow within company?
    8. Is the information flow within your department are documented?
    9. If the documentation exists, What type of document that you use for recording the information flow within your department?
    10. Which process that would you like to be audited by us?

4. **Questions Focused on IT**

1. Which IT applications that are used to support the business process within company?
2. Which IT applications that are used to support the business process within your department?
3. Does company provide a system to share information among the employee?

Post-Audit Questionnaire

The aim of this questions is to check whether our study meet their expectation and to explore their opinion on our framework.

1. What does your company expect from our study?
2. Do you think the processes explained in the information audit can be easily followed by the employee?
3. Which processes of information audit that seems to be difficult to perform in your company?
4. Which part of the information audit framework that should be improved?
5. Which part of the information audit framework that is not necessarily included in the audit process?
6. What can be improved from the framework to get a better audit result?
7. After participating in our study, is your company willing to do the information audit regularly?
8. Does the result of the audit meet your expectation?

Appendix C

Table 27. Framework Analysis

Name	Author	Characteristics	Components	Process	Method	Limitation
Information Audit for IT Compliance	Kim (2011)	Focus on the IT compliance perspective on Enterprise Information System	Auditing (List of deficient factors regarding IT)	Planning and Execution	Provide a domain target based on the Kim's Enterprise System Model and Audit Checklist based on the legislation	Restricted to the enterprise information system
			Interpretation (Summarized the deficient factors for management)	Reporting	Evaluation indices refers to Kim (1999, 2007) model consider the strategy level, IT staff, IT infrastructure, supporting staff, system integration and utilisation	Kim's model focuses only on the IT compliance so they do not consider the business objectives as their input. In addition, business objectives are not included in the analysis part.
			Recommendation (correct the deficient factors)	Feedback	Reference Model (Kim's framework for the enterprise security architecture)	It does not have the creating awareness part in the initial step of audit
LSAM Framework	Wu & Qu (2009)	Security for Linux System	Audit Information Collection Module (it collect informations which are needed to do security audit mechanism)	Expanding the Audit Function in LSAM -> Design of Buffer		They don't define the preprocess and the postprocess of the audit

			Audit Log Management Module (records the data from the event log)	Define the log content and format -> Set the Log Query		The framework are designed based on the security architecture in LINUX.
			Audit Security Early Warning Module (decide the mechanism for warning and punishment)	Define of Rule Base RVA -> Dynanmic Response Algorithm Library in RVA -> Set the early warning and punishment		Each module seems not show any relation
ElCIA	Drus et al. (2008)	Aligning the business strategy with the information strategy	Business Strategy (What are to be accomplished by the company)	Form	Selection the IA council and set up its goals	The compliance checking is missing in the process of audit
			Information Strategy (information requirements, provisions, management, and governance)	Initiate	Identify and define the roles, scope, objectives of IA.	The framework also does not consider security dimension.
				Foster	Recruiting Information Auditor and Promoting Information Audit in organisation	

				Execute	Preparation of relevant documentation and work papers, identify current information provision, identify current and future information requirements, identify information flows among the business processes, identify information owner, validate data collected.	
				Analyse	Perform Gap Analysis, Develop solutions, categorise information, prepare action plan ti impelement solutions	
				Announce	Publish the result of IA, gather feedback from the employees	
				Reward	identify the division that has the most systematic and effective information practice	
				Review	Identify the implementation of the recommendation	
Security Audit for e-government	Bing and Bo (2014)	Analyse and tracing the event on the internet	Data Source	Collect Data Source -> Stored in Database -> Data Processing	Data Cleaning & Data Mining	Limited to system that connected to the internet

			Rule Base	Improved association rule mining	Pattern Matching	Focus only on the security part
				Match Log Data		The data analysed only the event log and history chat in that recorded in internet.
			Repository	Receive the audit content and report		They do not audit the procedure on how to secure the sensitive information.
COBIT Framework	Tingliao (2016)		Business Objectives	Plan and Organise		The target of Audit and the framework limited to the focus on the IT audit.
			Governance Objectives	Acquire and Implement		The framework used is not the latest version, this is COBIT 4.1.
			Information Criteria	Deliver and Support		
			IT Resources	Monitor and Evaluate		
SMART Auditing	Bukhsh (2015)	Information Audit process which is influenced by the smart computer concept	Input Data	Receive the Data from the smart sensor and effector		It is tailored for a system which adapt a smart computing concept.
			Data Processing	Analysis current situation by sampling the data, aggregation or clustering. (IST and SOLL)	Process Mining	The security dimension is missing.
			Transformation	Transformed the IST and SOLL into one format		
			Compliance Checking	Compare the IST and SOLL		

			Decision Makers	Give the report of the current business to the decision makers		

Appendix D

The responsibility of BAWASLU RI in Information Service[7]

- Bawaslu is obliged to provide, and/or publish public information that is under its authority to the applicant for information, in addition to information that is excluded, by statutory provisions;
- Bawaslu must provide public information that is accurate, correct and not misleading;
- Bawaslu is obliged to develop a management system and information service to guarantee the fulfillment of the right to information quickly, on time, at a low cost, and in a simple way;
- Bawaslu is obliged to provide assistance or assistance for applicants with information on special needs;
- Bawaslu is obliged to respond/follow up on questions, suggestions, complaints, and objections related to information services;
- Bawaslu is obliged to provide proof of receipt of information requests;
- Bawaslu is obliged to provide notification of requests for public information;
- Bawaslu is obliged to provide notification about the extension of the notice period for public information requests;
- Bawaslu is obliged to provide a receipt for providing information;
- Bawaslu is obliged to provide information as requested by the applicant by the provisions of the legislation;
- Bawaslu is obliged to protect the personal data of information applicants;
- Bawaslu is obliged to provide information about service procedures, service announcements, applicant's rights, and other information related to the process of fulfilling the right to information;

[7] https://ppid.bawaslu.go.id/hak-dan-kewajiban-bawaslu-dalam-pelayanan-informasi