# Factors Influencing Business-to-Government Information-Sharing Arrangements
## Understanding system architectures and governance structures in information-sharing

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# FACTORS INFLUENCING BUSINESS-TO-GOVERNMENT INFORMATION-SHARING ARRANGEMENTS

DHATA PRADITYA

# Factors Influencing Business-to-Government Information-Sharing Arrangements

Understanding system architectures and governance structures in information-sharing

## Dissertation

for the purpose of obtaining the degree of doctor
at Delft University of Technology,
by the authority of the Rector Magnificus, Prof.dr.ir. T.H.J.J. van der Hagen,
Chair of the Board for Doctorates,
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**Delft, January 2023**

**Dhata Praditya**

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# 1. Introduction

In his book, Peled (2014) imagined a utopian society where organizations, particularly government agencies, provide access to their data to be used by citizens and other organizations. The data are in an agreed-upon level of quality and already marked which ones are public data and which are private data. Organizations could process the shared data, link, and combine it with their own data, or use business intelligence or data analytics to understand the data, into information. Public organizations could use the information more effectively to make better decisions or policies, better prioritize governmental work, and provide improved service to citizens. Private organizations could use the information to explore potential new revenue streams, improve organizational performance, or improve services for their customers. Thanks to network effects, more and more organizations are realizing that the use of secondary data from external sources can also bring benefits to organizations, as mentioned above (the benefits of sharing information for organizations are discussed in section 3.2.4). As organizations are increasingly eager to exploit and increase their benefits, organizations can even invest in making it easier for outsiders to interact with their information assets. In the end, a new knowledge ecosystem would then be established within society and greatly contribute to revitalizing the community's life.

However, the reality is far from ideal, as is shown in the recent handling of the COVID-19 pandemic in various countries. Several information-sharing issues come to the surface, which has been addressed by prior studies (the barriers to information-sharing are discussed in section 3.2.5). Information-sharing-related issues, ranging from a lack of data quality, especially availability, accuracy, and accessibility, to the inability and slowness of information-sharing between government agencies, and private institutions (healthcare providers), can hinder the effective use of information. Other obstacles that arise from the technical side, include the unpreparedness of the information-sharing infrastructure, communication failures, and management failures in information-sharing, confusion about who is responsible for what, what should be done, where and to whom the data should be shared, and the like. Nevertheless, what can be learned from the pandemic is that the ability to share information has become a necessity, especially for government organizations, with either other public organizations, private organizations, or the community.

Prior studies inform us that information-sharing can be shaped in different ways (e.g., (Bharosa, Janssen, Klievink, et al., 2013; Romochkina et al., 2016; Rukanova, Ubacht, et al., 2021; van Engelenburg et al., 2017; Yang et al., 2014)) and implemented in many domains, including supply chain (Deghedi, 2014; Engel et al., 2014; Zaheer & Trkman, 2017), healthcare (Faber et al., 2017; Feldman & Horan, 2011; Ivanov et al., 2015), financial reporting (Bharosa, van Wijk, et al., 2011; Brown et al., 2009; Sayogo et al., 2014), disaster management (Bharosa et al., 2010; Desourdis, 2012; Desourdis & Contestabile, 2011), and cyber-security (Fleming et al., 2014; Zibak & Simpson, 2019). Using those studies as footholds, in this research, we investigate the implementation of information-sharing. We aim to analyze the architecture and governance structure of information-sharing systems and determine which organizational, inter-organizational, and technological factors influence them. We chose business-to-government (B2G) as the scope of our research because few studies have focused on the relationship between these types of organizations (Bharosa, Janssen, van Wijk, et al., 2013; Feldman & Horan, 2011). In B2G, there are issues not be found in other types of relationships between organizations. For example, the differences in organizational structures, objectives and goals, or the

level of IT maturity possessed by public and private organizations. We provide an overview of B2G information-sharing in the next subsection.

## 1.1 Business-to-Government (B2G) Information-sharing

Prior studies have addressed inter-organizational information-sharing in four different forms, business-to-business (B2B), government-to-government (G2G), government-to-business (G2B), and business-to-government (B2G). Most of the studies in inter-organizational information systems are focused on the business-to-business context (Bharosa, Janssen, van Wijk, et al., 2013). B2G information-sharing is defined in this study as:

> *"The process of exchanging data, by making data available to be accessed by others or by sending and submitting data to others, between governments and businesses through specific information systems and typically based on mutual agreements among the organizations involved for specific purposes."*

B2G information-sharing has actually been carried out for a long time, for example, for (financial) reporting (including tax, annual reports, financial statements, etc.), as well as for other information, like customers or companies statistics and other secondary data obtained by the company from its customers when providing products and services (Micheli, 2022). Previously, this information exchange was mostly done in the form of document exchange (or paper-based information-sharing). With increasingly advanced information and communication technologies (ICTs), organizations increasingly use digital information-sharing (Yang et al., 2014).

In its implementation, private organizations can submit their relevant information to public organizations voluntarily or mandated. Formal reporting requires a formal confirmation for data submission saying that the users knowingly submit the reports (Bharosa, Janssen, et al., 2011). In other cases, companies can also provide access to their data to government organizations, for example, in the form of open data (mostly in the form of statistical data) (Poulis, 2015), or also in the context of collecting infrastructure assets (Vancauwenberghe et al., 2014). There is also a reciprocal exchange of information, for example, in implementing information-sharing for cyber-attack countermeasures (Zibak & Simpson, 2019) or disaster management (Desourdis, 2012). From the explanation above, it can also be concluded that the main purpose of this initiative is usually to assist the government in improving public services or solving societal problems (Micheli, 2022), but it also does not rule out the possibility of providing benefits to private companies (European-Commission, 2018).

According to Bharosa, Janssen, van Wijk, et al. (2013), there are three motivations for B2G information-sharing: reporting, transaction, and policy development. The *reporting perspective* requires organizations to provide information to justify their activities to comply with certain laws or regulations. This information is usually sent by organizations regularly, for example, monthly or yearly. The *transaction perspective* requires organizations to provide information to finalize the transaction process, for example, invoicing in e-procurement process. The *policy development perspective* requires organizations to provide information that allows public agencies to create new policies or determine the effectiveness of their existing policies. In line with those studies, Yang and Wu (2013) identified 7

purposes of information-sharing, which are: administrative work, information search and verification, information aggregation, business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency. In addition, according to Oliver (1990), there are six motivations for inter-organizational information-sharing: necessity, asymmetry, reciprocity, efficiency, stability, and legitimacy. Information-sharing motivated by necessity refers to the organizations' need to share information due to the demands of compliance requirements. Information-sharing based on asymmetry means information-sharing is done by exerting power; for example, information regarding the availability of vendors' materials by the project owner. Reciprocity refers to information-sharing based on the importance of building bilateral relations between organizations. Information-sharing motivated by efficiency is related to information-sharing that can help simplify business processes between organizations. Stability refers to information-sharing as an adaptive response to environmental uncertainty. Last, legitimacy is a motivation for organizations to share information due to pressure or the need to be recognized by peers or society, and deals with the image of organizations. Information-sharing with others can be motivated by one of the aforementioned reasons but also can have more than one reason (Ikeya et al., 2010; Yang & Wu, 2013). In addition, different motivations may reflect on different information-sharing arrangements (Romochkina et al., 2016).

Governments and businesses might have different perspectives and objectives. Governments' main responsibilities toward business include enacting regulations to ensure businesses to function, ensuring the development and growth of businesses, and protecting consumers. For these purposes, governments have been issuing laws and regulations that should be obeyed by many society members. However, businesses might see those laws and regulations as sometimes excessive or poorly designed, which creates uncertainty and add to the administrative burden. Worsened by the sometimes rigid communication by the governments, those issues are sometimes perceived as the main causes of economic failure (Beales et al., 2017). Furthermore, government agencies tend to analyze problems from a macro level and political view, while businesses usually act at the micro-level and take it from an economic point of view (Arendsen et al., 2014). For example, in a high-risk market (e.g., food chain or healthcare), governments can create more detailed regulations for supply chains to ensure the comprehensiveness of information for policy-making and reduce risks for society. While from a business perspective, more detailed regulations may result in higher compliance costs, in terms of more detail and rigid processes to be followed and more reports (Bharosa, Janssen, van Wijk, et al., 2013). Therefore, prior studies have underlined the need to understand each stakeholder's value proposition for a successful B2G information-sharing (Feldman & Horan, 2011; Klievink et al., 2016; Pouloudi et al., 2016).

Participants of B2G information-sharing can be varied at the organizational level. From organizational size and area of authority, the participating organizations potentially range from small and medium enterprises (SMEs) to multinational enterprises (MNEs) and from local to state and federal agencies. This means interaction and information flow can take place vertically and horizontally (Yang et al., 2012; Zheng et al., 2009). It may also involve different levels of public authority (e.g., between Central Banks and private banks) or market share/capital level (e.g., market leader, multinational enterprises, and SMEs), which means there is a possibility of power and information asymmetry, as well as different levels of organizational readiness in terms of IT and financial capability (Scholl & Klischewski, 2007). More diverse participants are influencing the way information-sharing is performed (Sayogo & Gil-Garcia, 2014), and likely results in more complex information-sharing arrangements (van Engelenburg et al., 2019).

As public and private organizations are eager to gain benefits from information-sharing, balancing benefits, risks, and costs from the initiative is becoming another challenge. From several implementations, it was found that the benefits for the government were more than those received by the company (Calo et al., 2012; Zhang et al., 2005). This might be because most of the B2G information-sharing is driven by the societal need resulting in the perception that the government is greatly helped by information-sharing while businesses are not. Since participants of information-sharing can come from various businesses, there is a potential risk perceived by a company due to the information is not kept confidential and might impact their competitive advantage in the market (Romochkina et al., 2016; Urciuoli et al., 2013); this may also relate to trust between participants. Information-sharing might require investment in information systems supporting information-sharing, for example, to adopt new data standards, improve IT capability, or ensure interoperability. From a business perspective, especially, it is necessary to calculate whether the benefits overcome the risks and costs incurred. Accordingly, in terms of balancing benefits, risks, and costs, businesses might need to be assisted with incentives as well as technical and legal protection.

Different types of information can be shared. In terms of public and private sectors, the shared data could be tax reports, statistical data, development reports, invoice statements, and the like. Data held by private sectors can help governments provide better public services or support policy-making through analytics, better supervision/inspection, or insight into economic growth. For example, consumer statistics can help governments respond to epidemics, improve urban planning and environmental protection, or monitor the market. Information-sharing may involve open and closed data and, in many cases, have to deal with personal data that might cause privacy challenges (European-Commission, 2018). In addition, to distinguish which data is shareable and which is not, it must be determined beforehand. The purpose of information-sharing should also include the purpose of the data being shared, and be one of the main parameters in the decision-making to share or not to share (Akbulut et al., 2009; Yang & Wu, 2013). The decision is important since it may affect, for example, a company's competitive advantage in the market or other future implications, such as becoming a liability to certain organizations. In B2G information-sharing, the availability of technical and legal protection is critical for the adoption, especially for businesses. The information-sharing arrangements need to accommodate these data factors, including different types of data, level of expected data quality, or sharing frequency.

If we look further from the users' perspective, there are several requirements for information-sharing. Personal data protection is one of the main issues in information-sharing (Lips et al., 2011). Information-sharing arrangements, for example, must be able to make users feel safe to share data (potentially sensitive data) with other parties, make users feel safe using them, and the exchange process must be trustworthy (Savoldelli et al., 2014). Another issue for users is the ease of use of an information-sharing application (Nam, 2014). The application should provide complete and detailed guidelines on how it works, including technical support if necessary. There is also an issue regarding the certainty of getting the benefits of information-sharing (Praditya & Janssen, 2015), including whether specific arrangements can have an advantage over others. We provide an overview of information-sharing arrangements in the next subsection.

## 1.2 Information-Sharing Arrangements

There are different ways to share information. Prior studies provide several characteristics of information-sharing, such as voluntary or mandatory information-sharing (Davenport & Prusak, 1997; Pardo et al., 2010). The shared data take various forms as in paper-based or a digital format, including PDF, CSV, and other formats (Gil-Garcia et al., 2009; Yang et al., 2014). Data can be shared through the act of partnering, dissemination, or fusion (Crowther, 2014). Apart from directly building a point-to-point interface, information-sharing may require a collaborative information system between participants (Ikeya et al., 2010; Yang & Wu, 2014), using a standardized conceptual scheme (Yang & Wu, 2014), and using either push (submit the data) or pull (making the data available to be accessed by others) mechanism (Bharosa, Janssen, Klievink, et al., 2013; Yang et al., 2014).

In terms of governments and businesses, examples of various information-sharing arrangements include a Data Pipeline for container-shipping transactions (van Engelenburg et al., 2015), Standard Business Reporting (SBR) for financial reports (Bharosa, van Wijk, et al., 2011), Public Safety Networks (PSNs) for public safety response (Kożuch & Sienkiewicz-Małyjurek, 2015), Continuous Control Monitoring (CCM) for food processing chain (Bharosa, Janssen, van Wijk, et al., 2013), or information-sharing systems supporting healthcare system (Batra et al., 2015).

Each arrangement is unique and case-dependent. For example, SBR is a government program that aims to reduce the administration burden for financial reporting by electronically exchanging and processing information between reporting parties (companies) and requesting parties (government) in a standardized way (Praditya et al., 2017). SBR uses a shared infrastructure to support bilateral information exchange between parties. The shared infrastructure in SBR acts as a data hub capable of filtering data according to the objective and destination. In the data pipeline case, there are two architectures for information-sharing called *'Thick'* and *'Thin'* architectures which serve different purposes and situations (van Engelenburg et al., 2017). In the *thin* architecture, the data parties send via the pipeline contain only metadata and pointers to the actual information. This type of architecture is suitable if various participants are joining information-sharing and participants need to control access directly. While in the *thick* architecture, the actual shipping information is being shared. As opposite to the previous architecture, this architecture is fit for a limited number of participants with less varied type of organizations and do not require control access directly.This raises the question of which factors have influenced the establishment of different types of arrangements. In general, prior studies show that there are many approaches to arranging inter-organizational information-sharing, based on technological requirements, organizational, and inter-organizational characteristics. Each approach may have its advantages and disadvantages.

With the advancement of information and communication technology (ICT), more and more information has been shared digitally. This leads to many advantages compared to paper-based mechanisms, including shorter response time, lower costs, and improved data quality (Yang et al., 2014). However, Information-sharing is not only about technology. Gil-Garcia et al. (2009) suggested four components of inter-organizational information-sharing as a socio-technical phenomenon:

1) Trusted Social Network, which deals with managing existing relationships between actors based on trust;
2) Shared Information which deals with data and information to be shared during the process;
3) Integrated Data which deals with integration and standard at data level;

4) Interoperable Technical Infrastructure deals with the IT-ability of two systems for joint functioning, exchanging information in a reciprocal way, and to use the information that has been changed.

Complementing this study, Fedorowicz et al. (2014) provided design observations which consist of several parameters to be considered in arranging information-sharing: the organizational structure, governance of the system, regulation, investment, diversity of users, experience, IT maturity, standardization, system security, accessibility and data ownership, IT governance in internal organization, interoperability, power balance, and sharing frequency. Both studies imply that the concept of information-sharing is not just about the application of technology (ICT) represented by its architecture, but also about governance aspects. The main reason for this is that information-sharing involves multiple and diverse actors, with a different understanding of values regarding information-sharing, be it the sharing activities itself or the implementation of a new system to support the activities. Given the importance of architecture and governance structure of information-sharing, these two dimensions were used throughout this research in conceptualizing information-sharing arrangements.

Therefore, in this study, an information-sharing arrangement refers to*:*

> *"All elements and their relations supporting information-sharing. Information-sharing arrangements are characterized by the implementation of certain architecture and governance structure of information-sharing system."*

*A system architecture* is defined as "*the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution*" (Software Engineering Standards Committee, 2000, p. 3). System architecture (to simplify, we use the term architecture throughout this thesis), should be agile enough to deal with the rapid change of the business and future technology adoption. In this research, we conceptualize architecture in information-sharing systems based on insights from several studies, including:

1) Discussion on how the information is shared cross-boundary by Yang et al. (2014). In their research, they provided four types of electronic information-sharing: electronic media storage, electronic interface, electronic gateway, and service platform;
2) Discussion on the type of inter-organizational system (IOS) by Choudhury (1997). Based on this research, IOS can be divided into three types: electronic monopolies, electronic dyads, and multilateral;
3) Discussion on IT architecture maturity by Ross (2006), which presented that IT architecture can be divided into four types: silos, standardized, optimized core and business modularity;
4) Discussion on the characteristics of E-Government maturity from the architectural perspective by Janssen and van Veenstra (2005), which provided that there are five levels of E-Gov maturity: no integration, one-to-one integration, data warehouse, broker, and orchestrated broker;
5) Discussion on the approach of Enterprise Application Integration (EAI) in E-Government architectures, based on Linthicum (2000) and used by Janssen and Cresswell (2005).

The aforementioned studies describe architectures of information-sharing systems from various points of view. In this research, especially in the case study analysis, we used these studies as references for analyzing the architectural aspects of the implementation B2G information-sharing in

the investigated cases. For example, what type of IOS is used to implement SBR or at what level E-Government maturity is AEOI in Indonesia.

On the other hand, governance structures are "*designed to coordinate specific transactions among multiple actors concerning labor, capital, intermediate goods, information and the like*" (Koppenjan & Groenewegen, 2005, p. 246). Governance is about decision-making procedures, roles and responsibilities of involved actors, stakeholders' engagement, and control of the system (Fedorowicz et al., 2015; Sambamurthy & Zmud, 1999; Weill & Ross, 2005). In this research, we build upon concepts from prior studies, including:

1) IOS governance (see (Aleem & Al-Qirim, 2012) or (Chatterjee & Ravichandran, 2013));
2) IT governance (see (Peterson, 2004), (Weill & Ross, 2004) or (IT-Governance-Institute, 2003));
3) Interoperability Governance (Wimmer et al., 2018); and
4) Governing E-Government (see (Ulriksen et al., 2016), (Klievink et al., 2012b), or (Pang, 2014)).

Similar to the analysis of system architecture, we also extracted those references for the governance structure to identify the critical aspects of governance structure used for B2G information-sharing. For example, what kind of decision-making structure used in the SBR, or whether AEOI in Indonesia is enabled by regulation or done voluntarily.

## 1.3 Research Objective and Approach

This study assumes that understanding information-sharing arrangements, and the factors that influence them, can help researchers and practitioners in designing and governing B2G information-sharing systems and thus, bring expected benefits to organizations and society. Following that, we identified some aspects this research can add to the inter-organizational information-sharing domain. First, most of the previous studies focused on the factors that influence the adoption of information-sharing, especially on the decision to share information with other organizations, as well as lessons learned from the implementation of information-sharing systems, including potential benefits, challenges, and success factors. Prior studies have provided explanations on how information is shared between organizations, particularly from technological aspects. This study, while complementing knowledge in benefits and challenges in inter-organizational information-sharing, adding from B2G domain, aims to explore on how to arrange B2G information-sharing, discussing why certain types of arrangements are preferred than others.

Next, we also identified a lack of studies addressing B2G information-sharing, although the need for information-sharing in this context is increasing. B2G presents challenges that may be specific and not found in other types of inter-organizational relationships. Businesses and governments have their own role in society and should be able to support each other. Government organizations are perceived as entities with a bureaucratic and hierarchical structure. They aim to provide public services and serve society's well-being, driven by constituents' needs, and focus on legal or political processes (Rabaiah & Vandijck, 2007). This type of organization is assumed to have a lower technology (especially IT) maturity and capability than companies (Dawes, 1996; Janssen & van Veenstra, 2005; Zhang et al., 2005). Modern companies, on the other hand, are supposed to be flexible and dynamic, highly adaptable to changes, operate in an agile manner, are data-driven, and emphasize customer experience in delivering their products and services (De Smet et al., 2021). The different characteristics of these two types of organizations can add complexity to the implementation of B2G information-

sharing in accommodating the needs of both government and companies. Based on this explanation, this study focuses on B2G information-sharing.

Moreover, some prior studies have focused on the governance structure of inter-organizational systems on the basis that uncertainty regarding the responsibilities of users (or participants), communication mechanisms, and decision-making methods are the cause of many information-sharing failures (see Crowther (2014); Desourdis and Contestabile (2011)). Aligning the architecture and governance structure can provide a better picture of the arrangements implemented in information-sharing. Although several studies have discussed the interplay between system architecture and governance structures, most are within the scope of internal organizations or companies (see Goode (2014); Mohammed et al. (2015)). To the researcher's knowledge, this interplay has been less discussed in the inter-organizational scope. In this study, we focus on investigating the types of system architectures and governance structures used in the implementation of B2G information-sharing and the factors that influence those information-sharing arrangements.

Finally, this research adds to the variety of research in information systems that employ mixed methods, which, according to Peng et al. (2011) and Venkatesh et al. (2016), is a methodology that still needs to be explored in the information systems domain. This methodology may require more time to understand both qualitative and quantitative analysis and how to mix each method effectively. To the researcher's knowledge, there were few studies addressing information-sharing from quantitative analysis, let alone mixed-methods, so this research has also aims to contribute in that specific area.

Considering the gaps found in the literature and the potential contribution of this research, the purpose of this study is:

*"To provide a deeper understanding of B2G information-sharing arrangements by investigating the structure of the arrangement (in the form of system architecture and governance) and the factors that influence it."*

From the research objective, we developed four research questions. These questions reflect the research steps or phases as follows:

1) What are the benefits and barriers of B2G information-sharing?
2) What are the elements of information-sharing arrangements?
3) Which factors influence B2G information-sharing arrangements?
4) Which factors (or combination of factors) influence elements of information-sharing arrangements?

The first and second research question can be answered using literature review and investigating cases. From investigating cases, we can also obtained insight to answer the third research question. In addition, to test the relationship between factors and information-sharing arrangements requires a quantitative study. Therefore, this research employed mixed-method research to answer all of the research questions and achieve the research objective. The following phases were implemented in this study: 1) identifying key concepts and potential factors from literature, 2) investigating information-sharing in practice, and 3) hypothesis testing. For the first phase, we rely on insights from prior studies collected through structured literature review (SLR). The core concepts of the research questions were analyzed to see how this topic was addressed in prior studies, including information system theories that are relevant to this research. There have been many models which aim to study the successful adoption of information-sharing arrangements. Those studies usually refer to technology adoption

models such as Diffusion of Innovations (DoI) model, DeLone and McLeane model, Technological-Organizational-Environmental (TOE) model, or the Technology Acceptance Model (TAM). Those models are primarily based upon understanding the linkages among quality, satisfaction, and usage. In terms of information-sharing involving public organizations, Yang and Maxwell (2011) and Akbulut et al. (2009) provided a list of determinants of information-sharing adoption that have been used in many other studies.

In the second phase, we conducted multiple case studies to capture empirical information on the different types of information-sharing arrangements implemented in business and government relationships. We selected two cases in implementing information-sharing systems between public and private organizations in financial reporting: the implementation of XBRL as data standard for financial reporting and the implementation of Automatic Exchange of Information (AEOI). For both cases, we collected data in 2 countries, the Netherlands and Indonesia. We used the following set of criteria in selecting the case studies: 1) The cases should represent the implementation of B2G information-sharing, including bringing various stakeholders; 2) The cases should be varied in their stage of implementation; 3) The cases should have historical data, at least one year, to allow us capturing the dynamic of the system implementation; and 4) the cases should be accessible, in term of the availability of data and potential respondents.

ICT offers many options to facilitate information-sharing inter-organizationally, so the dynamic of information-sharing arrangements needs to be understood since it may also improve the adoption of information-sharing. For example, the selection of a centralized or decentralized architecture, the various options of inter-organizational governance, data management approaches and sharing mechanisms used in the information-sharing systems. The list of factors identified in the literature review was evaluated using the case studies, including how they influence the information-sharing arrangements in each case.

In the third phase, the quantitative part, a survey, and statistical analysis were carried out to test the hypotheses. The proposed hypotheses explain the causal relationship between factors (cause variables) and the selected system architecture and governance structure (effect variables) used in B2G information-sharing. An online questionnaire was developed and distributed to selected respondents with enough knowledge of the B2G information-sharing system through a survey platform. Concerns about accuracy, validity, and reliability in generalizing the model came up during research planning due to the heterogeneous population. At least ten times the number of variables proposed as the minimum number of samples required (Hair et al., 2006) and also considering the trade-off between the estimated number of potential respondents who answered our survey offer and the time and cost of research in general. Exploratory Factor Analysis (EFA) and Partial Least Square (PLS) were used to analyze the data collected from surveys. The first analysis helps in ensuring latent variables created for the model are valid, while the second analysis was used as a tool for hypothesis testing and model testing. This step results in a final model that describes factors that influence the selection of certain arrangements and indicates the degree of influence of each factor in the model.

## 1.4 Thesis Outline

In this section, we present outline of this book. As described in Figure 1-1, we discuss the design of this research in Chapter 2. Chapter 2 is started with the discussion of the research paradigm underlying this research and followed by an explanation of the selected research strategy.

The theoretical foundation of this research is presented in Chapter 3. Findings from a Systematic Literature Review (SLR) are elaborated in this chapter. Firstly, we discuss theories regarding inter-organizational information-sharing, including its benefits and challenges and fitting it in the context of B2G relationship. Secondly, we discuss various types of inter-organizational governance mechanisms, their characteristics, and how they are applied in the existing implementation of information-sharing. Thirdly, we discuss the system architecture which facilitates inter-organizational information-sharing. Chapter 3 also provides potential influencing factors from prior research, which were addressed using case study research and statistical analysis.

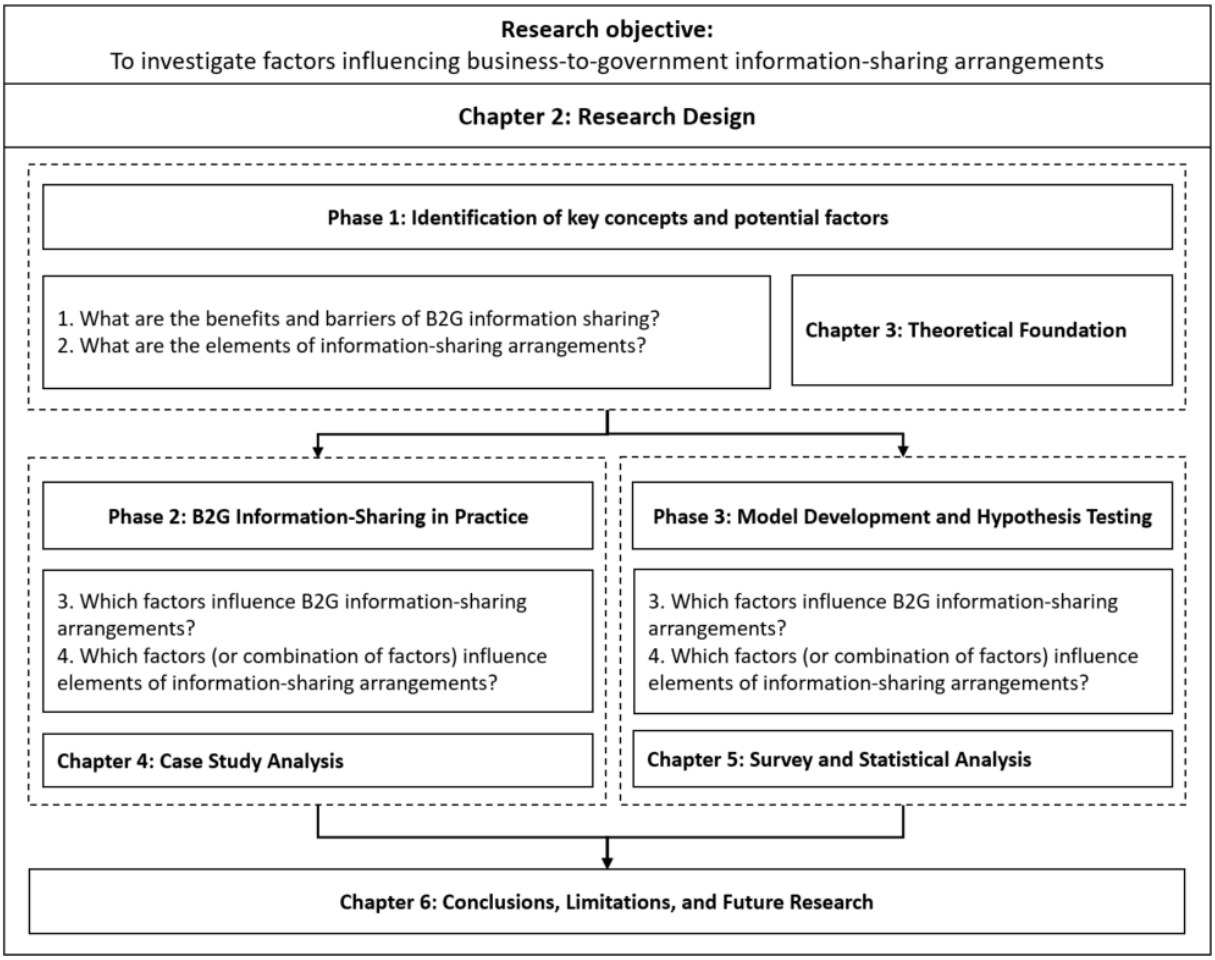


**Figure 1-1 Thesis Outline**

Chapter 4 contains an analysis of the case studies. Two cases on financial reporting systems as specific implementations of B2G information sharing are described in detail. A taxonomy used to explain the information-sharing arrangements is extracted from these two cases, comprised of the governance, process, data, and infrastructure level.

Drawing on the theoretical and empirical foundations, we present the initial model and the hypotheses of each potential relationship between variables from the model in chapter 5. The quantitative analysis, including information regarding survey respondents, statistical analysis selected for this study, limitations, and the results (including the final model that explains the relationships between factors and information-sharing arrangements), are also presented in Chapter 5.

Chapter 6 revisited the main findings of this research from each research question. Then, we discuss the study's scientific implications and practical recommendations. We conclude this thesis with a discussion of the limitations of this study and suggest potential avenues for further research.

## 1.5 Origin of the Chapter

Some of the findings presented in this book have already been published in academic articles. In this section, we present the origin of each chapter to provide insight into to which extent the chapters have already been peer-reviewed by the international research community.

1) The benefits and challenges of B2G information-sharing presented in Chapter 3 (specifically 3.2.4 and 3.2.5) are more detailed and elaborated discussions that have been discussed in Praditya and Janssen (2015), especially in explaining each benefit and challenge.
2) Factors influencing B2G information-sharing shown in Table 3-5, Table 3-6, and Table 3-7 in Chapter 3 have been published in Praditya and Janssen (2016).
3) The discussions of the case studies presented in Chapter 4 have been partly published in Praditya et al. (2017) for the first case study and Kurnia et al. (2019) for the second case study. In the second article, the content was mainly based on the thesis of the master student, who is the first author. However, some additional insights were added from my research into the article to analyze the structure of information-sharing arrangements and explain which factors were influencing the arrangements, to make it align with the purpose of this research. In Chapter 4, the discussion of each case is presented using a framework, which was formulated after the publication of both articles.

# 2. Research Design

As presented in the previous chapter, this study investigates factors influencing information-sharing arrangements in the B2G context. This research draws on the understanding that the relationship between information-sharing participants and the information-sharing arrangements could improve the willingness to share information using the information-sharing system. In this research, an investigation is carried out to obtain facts from existing implementations of B2G information-sharing following exploratory research defined by Sekaran and Bougie (2016). This research focuses on arranging information-sharing systems from a socio-technical system's perspective, specifically, which architecture and governance structure of the information-sharing systems are preferred by organizations, under what circumstances, and what are the determinants of a particular arrangement. As for the time horizon, this research is cross-sectional by studying objects within a certain period (Sekaran & Bougie, 2016).

This chapter presents the research design. Research design is defined as "the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement, and analysis of data" (Kothari, 2004, p. 31). This chapter is structured following the framework proposed by Creswell (2009) presented in Figure 2-1.

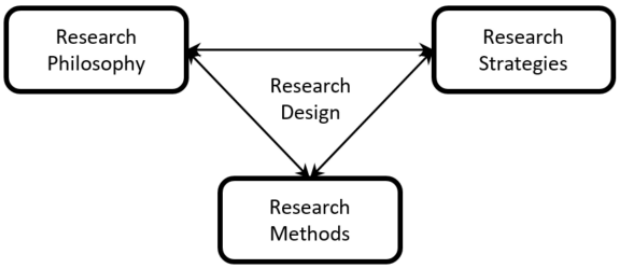


**Figure 2-1 Research Design Framework (Creswell, 2009)**

This chapter begins with a description of the adopted research philosophy, followed by an explanation of the chosen strategy. Then, we discuss how this study contributes to the development of theory. Lastly, the phases conducted in this research are presented and linked to the research questions and methods used in data collection and analysis.

## 2.1 Research Philosophy

Research philosophy can be defined as "*a system of beliefs and assumptions about the development of knowledge… including (but are not limited to) assumptions about the reality encountered in research (ontological assumptions), about human knowledge (epistemological assumptions), and about the extent and ways the researcher's own values influence the research process (axiological assumptions)*" (Saunders et al., 2019, p. 130). Attention to the philosophical assumptions is significant because these assumptions serve as a guide during the research process. In information systems (IS) research, ontological assumptions shape how researchers see IS as a research object and determine the choice of what to research, including unit of analysis and unit of observation [58]. Hirschheim (1985) claimed that IS epistemology is adopted from social sciences because information systems are closer to social

systems rather than technical ones. In addition, according to Hirschheim (1985), epistemology talks about how we acquire knowledge can be approached from two basic points: what is knowledge and how we obtain "valid" knowledge. On the other hand, axiology can be considered a branch of research philosophy that deals with values (Hassan et al., 2018). Axiology is used to answer 'what is the role of values in the research?' or 'how should we deal with the values of research participants?' (Saunders et al., 2019). Furthermore, Hassan et al. (2018) stated that the discussion of values, especially ethics, in IS research is of particular concern today given the rapidly emerging use and spread of ICTs in society and the increasing capabilities of these new technologies, which create doubts and difficulties in ascertaining facts and its moral evaluations.

Therefore, the research philosophy guides the researcher in designing the research, including selecting the research strategy and using appropriate research methods (Creswell, 2009) and restricting the boundaries of the knowledge gained from research (Janssen, 2001). As an information systems (IS) research, this research can be investigated from different philosophical perspectives (Orlikowski & Baroudi, 1991). According to Saunders et al. (2019), there are five major philosophies of social science: positivism, interpretivism, critical realism, postmodernism, and pragmatism. Table 2-1 presents the differences between each philosophy based on their ontology, epistemology, axiology, and common research methods.

**Table 2-1 Comparison of Research Philosophy (Saunders et al., 2019, p. 144)**

| Philosophy | Ontology | Epistemology | Axiology | Typical Methods |
|---|---|---|---|---|
| Positivism | Real, external, and independent;<br>One true reality (universalism);<br>Granular (things);<br>Ordered. | Scientific method;<br>Observable and measurable facts;<br>Law-like generalizations numbers;<br>Causal explanation and prediction as a contribution. | Value-free research;<br>The researcher is detached, neutral, and independent of what is researched;<br>The researcher maintains an objective stance. | Typically deductive, highly structured, large samples, and measurement;<br>Typically using quantitative methods of analysis, but a range of data can be analyzed. |
| Interpretivism | Complex, rich;<br>Socially constructed through culture and language;<br>Multiple meanings, interpretations, and realities;<br>A flux of processes, experiences, and practices. | Theories and concepts too simplistic;<br>Focus on narratives, stories, perceptions, and interpretations;<br>New understandings and worldviews as a contribution. | Value-bound research;<br>Researchers are part of what is researched;<br>Subjective stance;<br>Researcher interpretations key to contribution;<br>Researcher is reflexive. | Typically inductive, small samples, and in-depth investigations;<br>typically using qualitative methods of analysis, but a range of data can be interpreted. |

| | | | | |
|---|---|---|---|---|
| Critical Realism | Stratified/layered (the empirical, the actual, and the real);<br>External and independent;<br>Intransient;<br>Objective structures;<br>Causal mechanisms. | Epistemological relativism;<br>Knowledge is historically situated and transient;<br>Facts are social constructions;<br>Historical causal explanation as a contribution. | Value-laden research;<br>The researcher acknowledges bias by world views, cultural experience, and upbringing;<br>The researcher tries to minimize bias and errors;<br>The researcher is as objective as possible. | Retrodicted, in-depth historically situated analysis of pre-existing structures and emerging agency;<br>Range of Methods and data types to fit the subject matter. |
| Postmodernism | Nominal;<br>Complex and rich;<br>Socially constructed through power relations;<br>Some meanings, interpretations, and realities are dominated and silenced by others;<br>A flux of processes, experiences, and practices. | What counts as 'truth' and 'knowledge' is decided by dominant ideologies;<br>Focus on absences, silences and oppressed/ repressed meanings, interpretations and voices;<br>Exposure of power relations and challenge of dominant views as a contribution. | Value-constituted research;<br>Researcher and research embedded in power relations;<br>Some research narratives are repressed and silenced at the expense of others;<br>The researcher is radically reflexive. | Typically, deconstructive – reading texts and realities against themselves;<br>In-depth investigations of anomalies, silences, and absences;<br>Range of data types, typically qualitative methods of analysis. |
| Pragmatism | Complex, rich, and external;<br>'Reality' is the practical consequences of ideas;<br>A flux of processes, experiences, and practices. | Practical meaning of knowledge in specific contexts;<br>'True' theories and knowledge are those that enable successful action;<br>Focus on problems, practices, and relevance;<br>Problem-solving and informed future practice as a contribution. | Value-driven research;<br>Research initiated and sustained by the researcher's doubts and beliefs;<br>Researcher is reflexive. | Following the research problem and research question;<br>Range of methods: mixed, multiple, qualitative, quantitative, or action research;<br>Emphasis on practical solutions and outcomes. |

From the IS research perspective, the study by Braa and Vidgen (1999) discussed the main aspects of information system research. They differentiated between three orientations of IS research: 1) explanation or prediction, 2) interpretation or understanding, and 3) intervention or change. This research investigates the implementation of information-sharing in the B2G context to gather insights about which arrangement can be used to enable the initiative and collect factors influencing the arrangement. The twofold premises of this research are, first, many approaches can be implemented to facilitate B2G information-sharing, and second, there should be determinants in selecting specific approaches. Understanding those two premises is assumed to improve B2G information-sharing in terms of quality and quantity. So, this research orientation combines the first and second orientations.

Since planning this research, it has been realized that this research is contextual in the domain, time, and location; taking efforts in understanding a small sample of B2G information-sharing to understand or project the B2G information-sharing as a whole. Moreover, we also realized that it might be hard to achieve generalizability since there is also a possibility that the findings might differ in different contexts, for example, in different industries or countries. Next, from the research methods selected, in addition to quantitative data through survey/questionnaire, data were also obtained from the perceptions of key people involved in the implementation process. This implies subjectivity, personal bias, experiences, and practices should also need be accommodated. Inductive and deductive reasoning are used together in this research. Hypothesis testing through statistical analysis of data obtained from a reasonably broad scope of online respondents was combined with personal experiences, stories, and assumptions of key people of B2G information-sharing implementations to understand the addressed problems. Considering all of the pointers above, this research seeks insights from practice in a narrow range of research areas and uses an external point-of-view (or the researcher cannot interfere with the research object), this research follows **pragmatism**.

Pragmatism refers back to classical philosophers such as Pierce, James, Dewey, and Mead (Goldkuhl, 2012). This philosophy emerged as a consequence of the disapproval of traditional assumptions about the nature of reality, knowledge, and research as pragmatic scholars reject the idea that social science research can only be investigated using a single scientific method (Kaushik & Walsh, 2019). The basis of pragmatism is that knowledge and reality are socially constructed beliefs and habits (Kaushik & Walsh, 2019). Thus, being pragmatic generally means agreeing that all knowledge is socially constructed, but some versions of these social constructs are better suited to individual experiences than others (Morgan, 2014).

As presented in Table 2-1, pragmatism uses plural methods (Goles & Hirschheim, 2000), and is based on the proposition that the researcher should use the most appropriate methodological approach to the particular research problem under investigation (Tashakkori et al., 1998). In terms of the research approach, the position of pragmatism is considered to be in the middle of positivism and constructivism. Positivism uses deductive reasoning with quantitative analysis, while constructivism uses inductive reasoning with qualitative analysis. Pragmatism accommodates these two poles with a flexible and reflective research design (Kaushik & Walsh, 2019). Flexible in terms of the researchers having the freedom to choose the methods, techniques and procedures that fit with their needs and purposes to understand the problems (Creswell, 2009). Reflective in terms of pragmatism emphasizes the importance of research problems and the nature of experience (Morgan, 2014).

Furthermore, Morgan (2014) identified three characteristics of pragmatism: 1) "*actions cannot be separated from the situations and contexts in which they occur*" (p.26); 2) "*actions are linked to*

*consequences in ways that are open to change*" (p. 26); and 3) "*actions depend on worldviews that are socially shared sets of beliefs*" (p.27). These characteristics underline the nature of experience held by pragmatism: "*two people cannot have exactly identical experiences, so their worldviews can also not be identical. There are always varying degrees of shared experiences between any two people that lead to different degrees of shared beliefs. The likelihood of acting in the same way in a similar situation and assigning similar meanings to the consequences of those actions depends on the extent of shared belief about that particular situation. Therefore, worldviews can be both individually unique and socially shared*" (Kaushik & Walsh, 2019, p. 3)

Goles and Hirschheim (2000) suggested pragmatism as an alternative paradigm in information system research due to its characteristics that enables understanding the interplay between research and practice. Many information systems research is problem-oriented research aiming to help managers solve their daily information systems management issues (da Silva et al., 2018). Pragmatism is needed to recognize the intrinsic of the various problem formulations faced by information system researchers to ensure the findings have practical contributions (Goldkuhl, 2008). Mendling et al. (2021) made inquiries about the adoption of pluralism and pragmatism approaches in information systems research. Their study shows that pluralistic methodology has been adopted widely and considered valuable in information systems. Analyzing the same data, using different methods, asking different questions, using different perspectives, and finally, coming to different conclusions provide rigorous research (Mendling et al., 2021).

One of the main criticisms of pragmatism is that scholars use it solely to justify their selected method(s), usually the use of mixed-methods (Kaushik & Walsh, 2019). While in positivism and constructivism, the philosophical assumption drives the selection of methodology, in many cases of pragmatism, the methodology is adopted before making philosophical assumptions. The methodology is adapted based on the need to answer research questions and not primarily focus on commitment to a philosophical doctrine (Kaushik & Walsh, 2019). Another criticism is about selecting the methodology without understanding the research problems clearly and heavily influenced by personal aspects of the researcher, such as history, location, social and political status, or belief system. Problem-centered nature of pragmatism is considered to limit its ability to identify and analyze structural problems from various point-of-view (Thompson, 1996).

From prior studies, there are two opinions about which research approach that is suitable for pragmatism: some scholars argue pragmatism provides the philosophical foundation to implement mixed-methods (see (Creswell, 2009)), while others argue that the best method for pragmatism is the one that produces desired interpretation of the research effectively, whether a single method, multiple methods or mixed-methods (Tashakkori et al., 1998).

## 2.2 Research Strategy: Mixed-methods Research

As we need both qualitative and quantitative approaches to reach the research objective, a mixed-methods was selected as the research strategy. Mixed-methods research is *"the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration*" (Johnson et al., 2007, p. 123). Mixed-methods approaches are used for three reasons: 1) to compare or combine qualitative and quantitative results; 2) to use qualitative analysis in explaining quantitative

findings; and 3) to explore using qualitative analysis and then generalize it to the larger population using quantitative analysis (Venkatesh et al., 2013). In this research, we particularly following the first reason which is to combine results from qualitative and quantitative research.

Furthermore, Venkatesh et al. (2016) provided guidelines for employing mixed-methods in research: first, decide if the research should use mixed-methods. This step involves evaluating "*the research questions, purposes, paradigmatic views, and contexts*" (p. 437) and deciding if employing mixed-methods is the best way to conduct the research. The second step is designing the mixed-methods research; to develop the research design and strategy suitable to answer research questions. Third, selecting approaches in collecting and analyzing the data. The fourth step is about developing meta-inferences from results. Meta-inference is "*the theoretical statements, narratives, or a study inferred from an integration of findings from quantitative and qualitative strands of mixed-methods research*" (Venkatesh et al., 2013, p. 438). The fifth step is about assessing the quality of meta-inferences. Lastly, we need to discuss the limitations and (potential) improvements of this study.

Philosophical views of this research have been discussed in the previous subsection, including the decision to use mixed-methods based on research objectives and research questions. The thesis outline (see Figure 1-1) shows the design for implementing mixed-methods. Mixed-methods require research objective(s) and question(s) and should always refer to those throughout the research activities. As a combination of qualitative and quantitative studies, characteristics of both methodologies should be applied in the mixed-methods. Typical questions and data analytics for qualitative and quantitative studies are different, so in mixed-method it is necessary to define, identify, and link properly between research phases, questions, and findings. Then, tentative interpretations could be made in each research phase, and they can be updated through several iterations by comparing, contrasting, combining, or differentiating the collected data.

In accordance with pragmatism, to achieve the research objective, we need to have theoretical and practical analysis supported by data. This research uses a quantitative and qualitative approach simultaneously, not in terms of time orientation but the treatment of results and findings, each with its own research questions. Creswell (2009) defined concurrent mixed-methods as "*research in which the researcher converges quantitative and qualitative data to provide a comprehensive analysis a comprehensive analysis of the research problem*" (p.16). Instead of qualitative confirming quantitative or *vice versa*, we employed results from both, based on hypothesis testing and case study, to build final findings. This means that during the research, results from each phase were looked back, evaluated, assessed, aggregated, and inputs for overall conclusions or meta-inferences. This type of mixed-method aims to collect as many insights as possible about information-sharing arrangements and factors influencing these arrangements. For example, trust is an important factor in one of the case studies. Still, trust was not identified in the other cases and was not statistically significant from the hypothesis testing. Our findings would be saying that trust is one of the factors influencing information-sharing arrangements, and this includes the explanation in which phase the factor was identified as influencing.

Due to the dependency between research phases, the quality of conclusions or meta-inferences depends on the strength of inferences that emerge from the qualitative and quantitative phases. Potential findings of mixed-methods include contradiction, convergence, or complimentary between qualitative and quantitative findings. According to Venkatesh et al. (2013), if the findings show contradiction or complementary, then it is suggested to re-examine or re-evaluate the findings to find

and explain the causes. At the same time, the convergence of findings may reflect reasonable quality inferences.

Moreover, Venkatesh et al. (2013) identified three advantages of using mixed-methods: 1) it provides multiple angles argument since qualitative and quantitative serve different purposes and helps researchers to generate a wider variety of different and/or complementary views; 2) it helps researchers to collect more evidences to support findings; 3) it enables researchers to use confirmatory and explanatory methods concurrently or sequentially, therefore, can be used to either evaluate or develop theory. If used properly, mixed-methods provide advantages that may compensate for the disadvantages of quantitative and qualitative research when used separately. The potential weakness of quantitative research in understanding the context or setting of real-world implementation can be complemented by qualitative research. In contrast, qualitative research is considered to have a deficiency of potentially biased interpretations made by the researchers and difficulty in generalizing the findings to large groups, something quantitative research can complement. Thus, by using both types of analysis appropriately, the strengths of each can cover the weaknesses of the other. This will provide a more complete and comprehensive understanding of the research problem than if only a quantitative or qualitative approach was undertaken.

In addition, Venkatesh et al. (2013) also identified some disadvantages of conducting mixed-methods, including the time needed and research required to understand both qualitative and quantitative analysis and how to mix each method effectively. In addition, the research design can be complex because the researcher needs to plan and implement one method by drawing on the findings of another, which requires more resources. Difficulties in resolving conflicts that arise in interpreting the findings, for example, qualitative and quantitative findings provide the opposite results, can also be a disadvantage.

Moreover, to ensure the quality of mixed-methods research, (Venkatesh et al., 2013) suggested some criteria from the design and explanation aspects presented in Table 2-2. The steps taken in conducting the research design were in accordance with the guidelines provided, so the quality evaluation would be expected to be clearer and easier. This research begins with identifying the problems obtained from gap analysis from previous research, which means that there is a particular purpose to be achieved by conducting this research. From the problems to be discussed, research objectives and research questions are defined. The necessity to use mixed-methods can be derived d from the research objectives and questions. This research requires insights obtained through practical experience from the implementation of B2G information-sharing to explore and conceptualize information-sharing arrangements, as well as identify the factors that influence the selection of the arrangements, requiring qualitative and quantitative research.

Required quality criteria for a quantitative study, as shown in Table 2-2 include validity (internal, external, and statistical conclusion) and reliability. Internal validity is the measurement to test the causal relationship between the dependent and the independent variable(s) (Yin, 2014). External validity refers to the measurement to determine the domain in which study findings can be generalized (Yin, 2014). Statistically, conclusive validity refers to an assessment of the relationship between variables to understand the probability that, statistically, the assessment provides the true co-variation between variables (Straub, 1989). Type I and type II errors are violations of such validity (Straub, 1989). Reliability refers to the consistency of measurement so that the operations of a study can be repeated and have similar results (Yin, 2014).

**Table 2-2 Quality Framework of Mixed-Methods Research (Venkatesh et al., 2013, p. 44)**

| Quality Aspects | Quality Criteria | Description |
|---|---|---|
| Design quality: The degree to which a researcher has selected the most appropriate procedures for answering the research questions | Design suitability/ appropriateness | The degree to which methods selected and research design employed are appropriate for answering the research question. For example, researchers need to select appropriate quantitative (e.g., survey) and qualitative (e.g., interview) methodologies and decide whether they will conduct parallel or sequential mixed-methods research. |
| | Design adequacy | Quantitative: The degree to which the design components for the quantitative part (e.g., sampling, measures, data collection procedures) are implemented with acceptable quality and rigor. Indicators of inference quality include reliability and internal validity. |
| | | Qualitative: The degree to which the qualitative design components are implemented with acceptable quality and rigor. Indicators of inference quality include credibility and dependability. |
| | Analytic adequacy | Quantitative: The degree to which the quantitative data analysis procedures/strategies are appropriate and adequate to provide plausible answers to the research questions. An indicator of inference quality is statistical conclusion validity. |
| | | Qualitative: The degree to which qualitative data analysis procedures/strategies are appropriate and adequate to provide plausible answers to the research questions. Indicators of quality include theoretical validity and plausibility. |
| Explanation quality: The degree to which credible interpretations have been made based on obtained results. | Quantitative inferences | The degree to which interpretations from the quantitative analysis closely follow the relevant findings, are consistent with theory and the state of knowledge in the field, and are generalizable. Quality indicators include internal, statistical conclusion, and external validity. |
| | Qualitative inferences | The degree to which interpretations from the qualitative analysis closely follow the relevant findings, are consistent with theory and the state of knowledge in the field, and are transferable. Indicators of quality include credibility, confirmability, and transferability. |
| | Integrative inference/ meta-inference | Integrative efficacy: The degree to which inferences made in each strand of a mixed-methods research inquiry are effectively integrated into a theoretically consistent meta-inference. |
| | | Inference transferability: The degree to which meta-inferences from mixed-methods research are generalizable or transferable to other contexts or settings. |
| | | Integrative correspondence: The degree to which meta-inferences from mixed-methods research satisfy the initial purpose of using a mixed-methods approach. |

For the qualitative study, the quality criteria include validity, credibility, dependability, confirmability, and transferability, as also shown in Table 2-2. Slightly different from quantitative

studies, validity in qualitative research refer to the suitability of the theories, tools, processes, and data used in the research (Leung, 2015). Credibility is the criterion of truth-value, which deals with assessing the similarity between what the researcher reports and what happens to the object under study (Krefting, 1991). Dependability is the criterion of consistency, which refers to assessing the consistency of the research findings (Baxter & Jack, 2008). Confirmability is the criterion of neutrality, which deals with an assessment of research findings obtained through confirmation or corroboration by others (Venkatesh et al., 2013). Transferability is the criterion of applicability, which refers to an assessment of the research findings to be generalized or transferred to other contexts or settings (Krefting, 1991).

One of the main characteristics of conducting mixed-methods research in dealing with research quality is triangulation (Fielding, 2012). Triangulation is a technique of using several means in the research to collect and analyze data on the same topic (Mertens & Hesse-Biber, 2012). Using triangulation, the validity of research through the use of a variety of methods which may involve different types of samples, involvement of more than one researcher, different data sources, as well as multi-methods of data collection is expected to be assured (Leung, 2015; Turner et al., 2017). Triangulation allows researchers to identify aspects of a phenomenon more accurately by approaching it from different point-of-view (Mertens & Hesse-Biber, 2012). Triangulation requires careful analysis, usually by double-checking the results, of the type of information provided by each method, including its strengths and weaknesses (Turner et al., 2017). Five types of triangulations can be employed in mixed-methods research (Hussein, 2009): 1) variety of data sources (data triangulation); 2) several different researchers (investigator triangulation); 3) multiple theories to interpret the results (theory triangulation); 4) multiple methods to study a research problem (methodological triangulation); and 5) variety methods in analyzing the same set of data (analysis triangulation).

In addition, another critical aspect in designing mixed-methods research is defining the unit of analysis, which refers to the object investigation (Bhattacherjee, 2021) for both qualitative and quantitative studies. The unit of analysis is very important for research in determining what types of data should be collected and from whom it should be collected (Bhattacherjee, 2021). If the research goal is to understand how firms can improve profitability or make good executive decisions, then the unit of analysis is the firm. The unit of analysis for this study is information systems used by public and private organizations for sharing information between them. This study was designed by taking into account and considering organizational perceptions of information-sharing, especially businesses sharing information with the government. So the point of view taken is the point of view of the organization, not the individual. However, it is possible to collect data from a lower level of analysis and aggregate that data to a higher level of analysis (Bhattacherjee, 2021). Using this argument, we collected data from respondents based on the request to represent their organization in this research.

There are 3 phases of this study; each phase answers a particular research question. The aforementioned overview of design should already provide an overview of the suitability of mixed-methods suggested by (Venkatesh et al., 2013). Moreover, each phase is presented in detail in the next subsection, including information about data sources, data collection methods, and analysis methods.

### 2.2.1 Phase 1: Systematic Literature Review (SLR)

The first phase of this research focuses on the identification of the novelty of this research in terms of the research gaps and identifying key concepts which serve as the theoretical foundation of this research. For this purpose, we used a systematic literature review as the research method in this

phase. SLR is a systematic, comprehensive, and reproducible method for identifying, collecting, evaluating, and synthesizing knowledge from previously completed and recorded research (Webster & Watson, 2002). Collecting information from a broad literature overview allows us to develop the existing knowledge base and identify problems and knowledge gaps. By filling the research gaps, the findings of this study could either extend the branch or create a new branch in the research domain with a strong foundation. The lack of attention to the importance of conducting a systematic literature review by IS researchers is highlighted by Levy and Ellis (2006) and Webster and Watson (2002).

As presented in Figure 2-2, SLR began by collecting articles on information-sharing at the organizational level. From the key articles, the definition of inter-organizational information-sharing as well as its approaches, types, and forms were identified. From the collected articles, we found out that there was a lack of attention to information-sharing between businesses and government agencies. The research was then directed to discuss that topic. We went further to collect articles about B2G information-sharing. The idea was to identify and collect articles discussing motivations, benefits, challenges, implementations and practices, and determinants of B2G information-sharing. Due to the lack of specification in B2G context, the keyword used to search the articles were in broad perspective rather than specified to B2G. Next, the topic of arranging B2G information-sharing was given attention by focusing on the questions: how the information is shared between private and public organizations and how to govern the information-sharing system. Last, we also collected articles that are relevant to the selected case study, the implementation of XBRL as a data standard in the financial reporting system, and the implementation of Automatic Exchange of Information (AEOI).

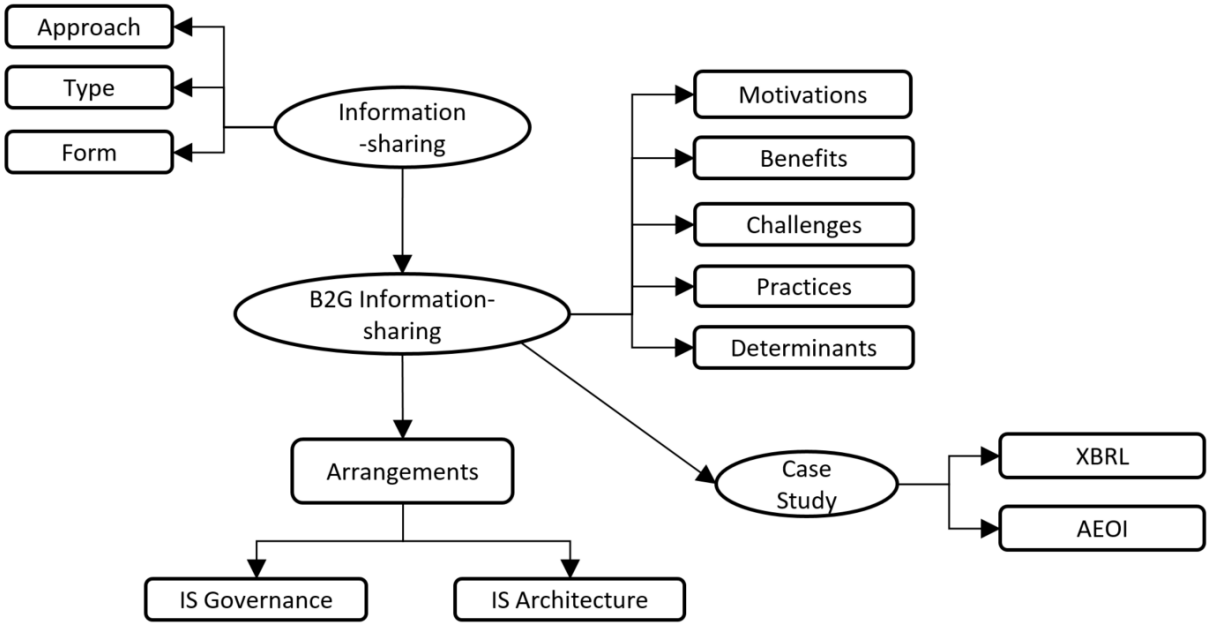


**Figure 2-2 Mind-map of SLR employed in this study**

Some keywords and a combination of keywords were used during data collection in SLR, as presented in Table 2-3.

**Table 2-3 Keywords used in SLR**

| Target | Keywords |
|---|---|
| General Topic | "Inter-organizational information-sharing" |
| | "Business-to-government" "information-sharing" |
| | "Business-to-government" "e-government" |
| Information-sharing Arrangements | "Inter-organizational system" |
| | "Information-sharing arrangements" |
| | "Information-sharing architecture" |
| | "E-government architecture" |
| | "Inter-organizational governance" |
| Case Study | "XBRL" "Information-sharing" |
| | "Automatic Exchange of Information" OR "AEOI" |

*Google Scholar* was used as the main articles search engine mainly due to its ease to use as it can show the list of articles based on keywords and, in many cases, direct access to an acticle, including the reference file. However, additional actions might be required to access some articles. This means sometimes we had to go to publishers' sites such as *JSTOR*, Elsevier, *Springer*, *Wiley*, *ACM*, *IEEE, or* others before downloading the articles.

In addition, the E-Government Reference Library (EGRL), later Digital Government Reference Library (DGRL), provided by the University of Washington (Scholl, 2018), was also used as a reference, especially for articles related to the use of technology in governments and also articles with leading authors in the e-government or digital government domains.

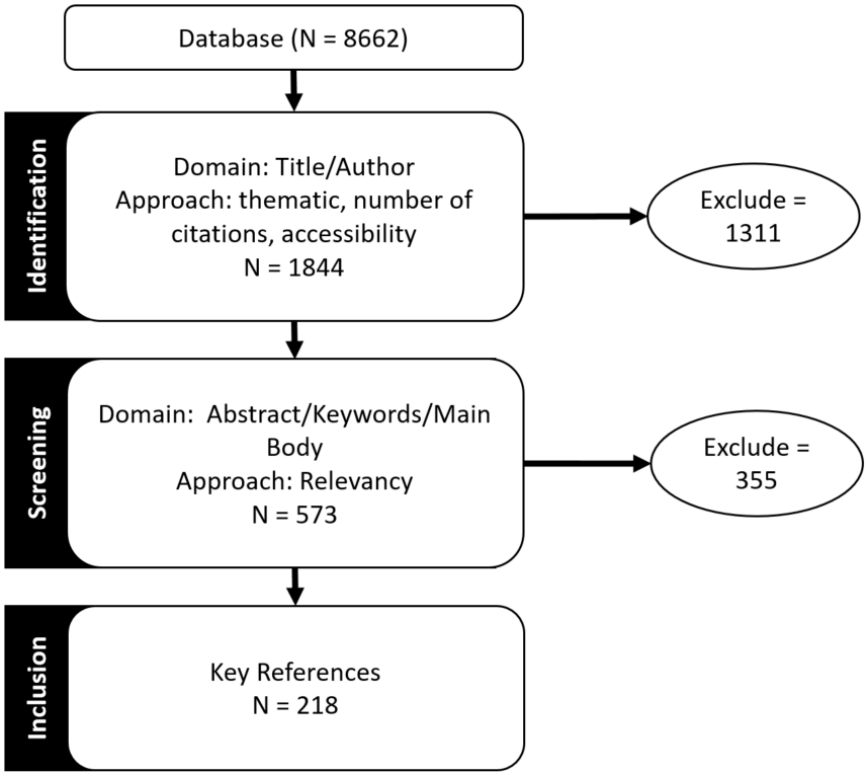


**Figure 2-3 Steps in identifying key sources**

The literature review in this research was carried out for two purposes. First, to build the theoretical foundation for our study. Second, to look for background information and secondary data for the case studies. As presented in Figure 2-3, four steps were taken for the SLR. Following these results, articles were sorted based on the number of citations. From this step, we could also identify key authors who work on a (more or less) similar topic to this study. Then we accessed and downloaded the articles; inaccessible articles or articles written in languages other than English were excluded in this step. Next, citation tracing was conducted. We checked the references section of each identified article to seek the cited articles and further used Google Scholar to find articles that cite the key articles. All collected articles were put in a 'database' (in this study, Endnote was used to manage references with an additional 'dump' file in Excel format to manage the summary and important information of key references). We then skimmed through each article to find relevance to the topic using criteria presented in Table 2-4. Finally, we identified key references for this study.

**Table 2-4 Criteria for Selecting Literature**

| Criteria | Decision |
|---|---|
| When the predefined keywords exist as a whole or at least in title, keywords or abstract section of the paper | Inclusion |
| The paper was published in a scientific peer-reviewed journal | Inclusion |
| The paper should be written in the English language | Inclusion |
| When the articles are relevant to at least one topic in Table 2-3 | Inclusion |
| Papers that are duplicated within the search documents | Exclusion |
| Papers that are not accessible | Exclusion |
| Papers that are not primary/original research | Exclusion |

The theoretical foundation and contextualization of this research following the findings of the SLR are addressed in Chapter 3.

### 2.2.2 Phase 2: B2G Information-sharing in Practice

In this phase, we conducted a multiple case study to investigate the existing implementation of B2G information-sharing. A case study is defined as: "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident" (Yin, 2014, p. 45). This methodology is useful if the objective of the research is to answer the "how" and "why" questions of contemporary phenomena in the real-life context (Yin, 2014). With case studies, in-depth qualitative insights can be explored, and complex causal links in real-life settings can be explained (Eisenhardt, 1989).

As part of the mixed-methods research, the case study as the qualitative analysis in this research aims to capture the meaning and perception of B2G information-sharing for the respondents. Inferences of qualitative analysis (definition provided in Table 2-2), as guided by Venkatesh et al. (2013) should be made based on data analytics from multiple sources of evidence. In addition, in constructing qualitative inference, research questions and design decisions are critical in influencing the theoretical reasoning techniques (deductive versus inductive) that the researcher uses (Venkatesh et al., 2016).

However, case studies are criticized for lacking specific procedures to be followed, so it tends to be ill-structured and depends heavily on the ability and competence of the researcher (Yin, 2014). In

addition, Yin (2014) also explained that another challenge in case study is to provide a basis for scientific generalization, although he further argues that the expected generalizability for this methodology refers to theoretical propositions and not to whole populations or universe. Furthermore, the researcher is required to provide a fair presentation of empirical data with proper arguments to convince the reader, unlike quantitative research, which usually provides numerical statements as the main visualization of results (Choy, 2014). To overcome the challenges and difficulties that can be faced in analyzing case studies, in this study we developed a case study protocol as a reference for the research process, especially with the use of triangulation.

#### 2.2.2.1 Case Study Protocol

Yin (2014) suggests developing a case study protocol to ensure the reliability of the case study research. The protocol guides the researchers in collecting data systematically, especially in multiple case study research. Case study protocol at least consists of the objectives of the case studies, the selection criteria of cases, the questions (information to be collected and the sources used to collect the information), procedures to collect the data, and methods used to analyze the data. In conducting the case study, we followed a framework provided by (Diehl et al., 2013). As presented in Figure 2-4, for the qualitative phase of this research, we developed a case study protocol consisting of three types of triangulation: multiple case studies, data triangulation, and researcher/investigator triangulation. Each of the triangulation used is presented in the next sections.

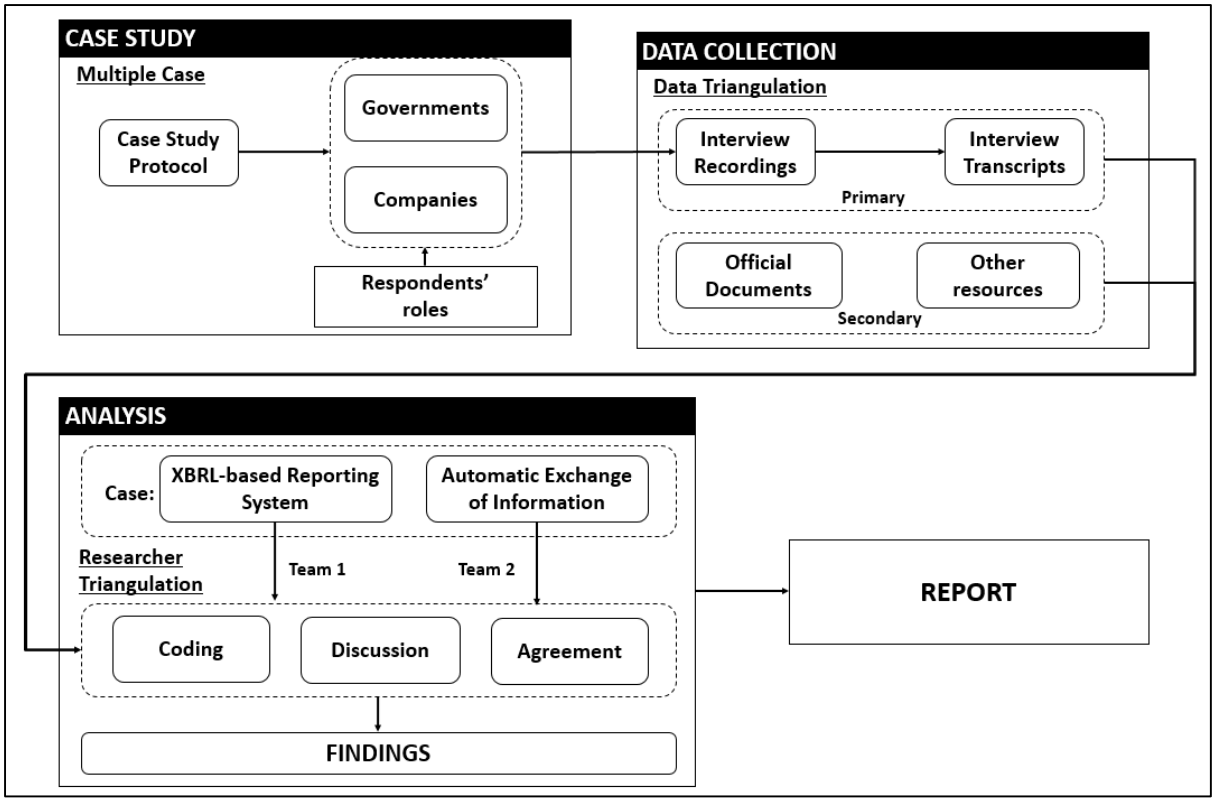


**Figure 2-4 Case Study Protocol Framework (adopted from (Diehl et al., 2013))**

#### 2.2.2.2 Case Study

According to Yin (2014), a single-case study is preferred when studying a critical case, an extreme case, a representative or typical case, a revelatory case (involving a novel situation), or a longitudinal case. A case to be investigated can be selected based on convenience, purpose, or probability, as discussed by Grosshans and Chelimsky (1990). The selection of the case instances is presented in Table 2-5. Selection is important to answer research questions properly and to reach generalizability. In addition, for multiple-case studies, each case should be selected to predict similar results (literal replication) or contrasting results but for anticipated reasons (theoretical replication). Both single and multiple designs can be either holistic (one unit of analysis per case) or embedded (multiple units of analysis per case). However, multiple cases can provide more robust outcomes than single-case research, especially in theory development (Eisenhardt & Graebner, 2007).

**Table 2-5 Instance Selection in Case Study (Grosshans & Chelimsky, 1990, p. 23)**

| Selection Basis | When to use and What questions it can answer |
|---|---|
| Convenience | The case is selected because of its suitability for the purpose of data collection. |
| Bracketing | The case is selected to show the extreme values and to explain the differences (in the implementation of information-sharing). |
| Best Cases | The case is selected to describe the best example of and to explain the success factors of information-sharing. |
| Worst cases | The case is selected to explain the reasons for failure of information-sharing. |
| Cluster | The case is selected to compare different types of implementation of information-sharing. |
| Representative | The case is selected based on or to represent important variations in the implementation of information-sharing. |
| Typical | The case is selected to represent a typical case in the implementation of information-sharing. |
| Special interest | The case is selected to highlight or to address an unusual or a special attribute in the implementation of information-sharing. |
| Probability | The case is selected to explain what happened in the general practice of information-sharing and the reasons for it. |

Table 2-6 elaborates on case study selection strategies as discussed by Flyvbjerg (2001).

**Table 2-6 Strategy in Selecting Cases (Flyvbjerg, 2001, p. 79)**

| Type of Selection | Purpose |
|---|---|
| 1. Extreme/deviant cases | To obtain information about unusual cases in detail, which can be either problematic or good. |
| 2. Variation cases | To obtain information about the significance of various criteria for case process and outcome. |
| 3. Critical cases | To achieve information that permits logical deductions of a criterion or factor. |
| 4. Paradigmatic cases | To highlight more general characteristics of the problem in question. |

Interest in discussing and exploring the implementation of Standard Business Reporting (SBR), as "new way" to deal with financial reporting, became the initial trigger of this research. Key people from

both reporting and requesting parties of SBR were willing to share their deep insights. Considering the options in Table 2-5, the instance selection of cases used in this research is based on "convenience" and "representative" selections. Then, it was necessary for this research to have a "variation" (as mentioned in Table 2-6) in cases while still comparable with the SBR, to gain the type of arrangements that can be utilized for B2G information-sharing. We used the following set of criteria in selecting the case studies: 1) The cases should represent the implementation of B2G information-sharing, including bringing various stakeholders; 2) The cases should be varied in their stage of implementation; 3) The cases should have historical data, at least one year, to allow us capturing the dynamic of the system implementation. 4) The cases should be accessible in terms of the availability of data and potential respondents. We selected two cases from these criteria, each consisting of two case objects. An overview of the cases is presented in Table 2-7 below.

**Table 2-7 Overview of cases investigated in this research**

| Case study name | Location | Focus Area | Main Objective | Stage | Actors |
|---|---|---|---|---|---|
| XBRL-based Reporting System | Indonesia | Financial Reports | Improving compliance of data providers | Mature | Data Providers: Banks (Private and Public) |
| | | | | | Intermediaries: Accountant Firms, software providers |
| | | | | | Data Collectors: Central Bank, Financial Service Authority |
| | The Netherlands | Financial Reports | Reducing the administrative burden of participating actors | Mature | Data Providers: Companies |
| | | | | | Intermediaries: Accountancy Consultants, Software Providers, *Logius*. |
| | | | | | Data Collectors: Tax Administration Office, Statistics Bureau, Chambers of Commerce |
| Automatic Exchange of Information Implementation | The Netherlands | Tax Reports | Reducing tax evasion | Early | Data Providers: Financial Organizations (Banks etc.) |
| | | | | | Intermediaries: Accountancy Firms, Software Providers, *Logius*. |
| | | | | | Data Collectors: Tax Administration |
| | Indonesia | Tax Reports | Reducing tax evasion | Early | Data Providers: Financial Organizations (Banks etc.) |
| | | | | | Intermediaries: Accountancy Firms, Software Providers. |
| | | | | | Data Collectors: Tax Administration, Financial Service Authority |

The two cases investigated were the implementation of B2G information-sharing in the financial reporting domain. The first case is the implementation of a data standard for business reporting called *eXtensible Business Reporting Language (*XBRL), while the second case is the implementation of *Automatic Exchange of Information* (AEOI). XBRL is an XML-based software language which developed as a new and standardized approach to simplify the way organizations prepare, validate, consume and analyze financial data. AEOI is a standard that supports the information-sharing of taxpayer accounts between countries at a certain time periodically, systematically, and continuously from "the source country" where individuals or groups of individuals have assets, do businesses, or save their wealth with "the home country" of those people.

The implementation of XBRL shows that B2G information-sharing can be done in various ways since XBRL is only a data standard that can be a part of a bigger system. Apart from the type of information-sharing arrangements implementation, another insight to be explored in this case is the dynamics of the factors and arrangements that may change along the timeline since both implementations are already mature.

As AEOI is introduced with a detailed guideline, the arrangements of AEOI are not as flexible as in XBRL implementation. In Indonesia, AEOI is implemented by making a standalone application from scratch, while in the Netherlands, AEOI can be considered an extension of the existing system. With the same objectives and requirements, AEOI implementation in the Netherlands is done by adding modules and functionalities to the existing information-sharing system, taking into account collaboration within the EU network. In contrast to Indonesia, the system is built in a simple and easy way, so that data providers can immediately adopt the system without being required to improve their legacy systems.

As presented in the case study protocol (in Figure 2-4), this research employed researcher triangulation, meaning that two additional researchers were involved during the case study. Both were then master's students at TU Delft. These researchers mainly helped with data collection and analysis. Both had links with the selected cases in Indonesia, thus facilitating the interview process and also the search for relevant respondents. The two master's students also used part of the data for their master's graduation projects and these are included in the resulting theses. However, there were differences in the focus and objective of the master thesis projects and this research. For the first case, the master student's research focused on adopting the reporting systems, whereas this research focused on information-sharing arrangements. The factors analyzed in the master student's project were factors influencing user adoption of the reporting system, while in this research, the factors being analyzed were factors influencing information-sharing arrangements. For the second case, the master student's research focused on the types of IT Infrastructure and its governance enabling the reporting of tax data for AEOI purposes in a country. Meanwhile, this research provided a more elaborated and detailed explanation to address information-sharing arrangements as well as the factors influencing information-sharing arrangements.

Primary data were collected through semi-structured interviews targeting key people in each case' object. Respondents were selected by their experiences with the information-sharing systems; the selected respondents should understand the system well. During the interviews, they were asked to provide the names of other people who were also involved in implementing the system. Respondents should have enough experience and provide information from strategic, operational/managerial, and technical perspectives. In addition, we also used secondary data, mainly collected from presentations (slides and videos) and the official documents derived from the official websites of each case.

We categorized respondents for each case study into the system owner, government agencies (requesting parties), and businesses (information providers). The respondents were selected from different levels in the organization, ranging from the strategic level to the technical level. Consequently, we obtained different types of emphasis and concerns from each interview question from different types of respondents. Top management plays a role in collecting information about the strategic level of an organization, especially in terms of how the investment was made in developing the information-sharing system, the level of participation of their organization in the decision-making process related to the information-sharing system, and also on how the organization ensured the availability of required resources. Middle managers are usually responsible for designing, selecting, and carrying out the best plan possible to drive the organization towards its objectives. Low-level managers interact directly with the system on a daily basis and have experience with issues that may occur during the sharing process.

The main purpose of the interview was to confirm the literature findings and enrich the understanding of the implementation of B2G information-sharing based on actual conditions. The interview questions are designed to be open and flexible, following the guideline of qualitative research. However, the topics discussed during the interviews were not limited to findings from the literature. The purpose of open-ended questions is to ensure that all important concerns of the respondents can be explored and identified. As a result, factors found in one case study may not be found in another, and vice versa. We let respondents share their experiences and insights during their involvement in B2G information-sharing as a case study. Sometimes we also asked for factors or arrangements found in the SLR that has not been mentioned by the respondents to ascertain the level of importance or relevance of these factors and arrangements in the case according to the respondent's understanding. In this way, we argue that the results of the interviews reflect all of the respondents' main concerns regarding the case.

The interview questions (provided in Appendix A) were divided into 4 parts: information-sharing arrangements, process-related, technology context, organizational context, and interorganizational contexts from the case. In the information-sharing questions, we collected information about the information systems used for information-sharing, including the type of systems, key actors of the information-sharing, timeline of the implementation, objectives and motivations of participating in the information-sharing, and lessons learned (main challenges and critical issues) from the implementation. On the second part, we asked about the sharing processes, including the requirements and how the reporting parties should prepare the data. During the third part, we captured information about whether any standardization was implemented for information-sharing, quality assurance, and security concerns regarding the system. Next, we asked about the benefits perceived by the respondents from information-sharing and whether it was needed to have organizational changes in information-sharing. In the last part, we asked about inter-organizational relationships and issues in implementing information-sharing. We also collected secondary data from official documents and other sources, including presentations and videos about the selected cases.

We conducted face-to-face interview sessions using English for the Netherlands' case study. For the Indonesian case study, we conducted face-to-face interviews, focus group discussions, video call, and e-mail correspondences using Bahasa Indonesia. Each interview was recorded with permission and transcribed. A summary of the interview transcript was created for each interviewee. Creating a summary for each interview is known as “reduction technique” (Maimbo & Pervan, 2005) to help us identify key and relevant information as well as to get a clear picture of the main issues. The summary

of the individual interviews was then sent back to each of the respondents for feedback and comments. Subsequently, a single document containing the summary from all participants was also provided to help the analysis. The interview transcript was sent back to each respondent for validation and verification to ensure there is no misinterpretation of the statements, to avoid any privacy, security, and confidential issues, and to ensure all the collected data are publishable.

For the data analysis, the coding process was conducted with the help of MS Excel and *Atlas.ti* as qualitative analysis tools. All collected data should be broken into meaningful pieces and eventually reconstructed to reflect reality (Baskarada, 2014). The combination of the interview transcripts, the relevant documents, and the researcher's notes were used as the main source of information. Coding is an iterative and incremental process. In this research, the coding process of each case was conducted by at least two researchers to ensure the quality of the results. Some of the available coding techniques, as explained by Baskarada (2014), were applied, including:

1) Keywords in context analysis (KWIC), using keywords to map the specific code;
2) Classical content analysis, identifying the most mentioned concepts;
3) Taxonomic analysis, understanding the possibility of multi-interpretation of the same keywords.

Then, the findings are discussed, compared, combined, and assessed by the researchers in order to further improve the quality of the inferences. For example, focusing the discussions on the most relevant factors, clustering factors into a proper category, avoiding misinterpretation, and getting mutual understanding between researchers.

Furthermore, one of the main differences between qualitative research and quantitative research is the goal (Baskarada, 2014). Qualitative research aims to provide analytical generalization instead of statistical generalization. The latter is the goal of quantitative research (Baskarada, 2014). Hence, the empirical case study results in qualitative research are compared with previously developed theory (Yin, 2014). Various interpretations by multiple respondents were taken into account, and the findings were classified/clustered based on the patterns found. All of the meaningful patterns found during the coding stages were analyzed and interpreted during the analysis process. Results of each case were provided using the following steps: first, an overview of the implementation was made; second, governance of information-sharing that includes stakeholder analysis using value network; third, the architecture of the information-sharing system that includes information chain diagram; and last, factors influencing information-sharing arrangements were made. Those results are presented in detail in Chapter 4.

### 2.2.3 Phase 3: Survey and Statistical Analysis

One of the goals of this study is to investigate factors influencing B2G information-sharing arrangements. Results from phases 1 and 2 provide the type of information-sharing arrangements and lists of factors that can potentially influence the arrangements. We then developed a conceptual model with a number of hypotheses. In this phase, we implement a quantitative study to test hypotheses explaining causal relationships between factors (as causal variables) and system architecture and governance structures (as effect variables) used in B2G information-sharing. Our aim was to create a parsimonious model. A parsimonious model can be defined as a model with a minimum number of parameters (or predictor variables) needed to explain complex phenomena (Byrne, 2016). Parsimony

does not mean simple, but the focus on essential factors to have enough predictive power (Byrne, 2016).

Using survey as the data collection method, this phase brings the numeric interpretation of a population's tendencies, behavior, and perspectives through the analysis of a sample of the aforementioned population. A survey can be defined as: "a systematic method for gathering information from (a sample of) entities to construct a quantitative description of the attributes of the larger population of which the entities are members" (Groves et al., 2011, p. 2).

The web-based survey were used in this study and distributed using an online platform called '*Prolific*'. *Prolific* academic (www.*Prolific*.co) is a UK-based online crowd-working research platform that aims to empower research by enabling fast, reliable, and high-quality data collection from diverse people worldwide. *Prolific* mission is to make trustworthy data more accessible to help improve human knowledge and decision-making (*Prolific*, 2022).

This online crowd-working platform is selected because it offers at-scale recruitment of potential respondents in a short time and access to a broader population (Palan & Schitter, 2018). *Prolific* offers good recruitment standards at a reasonable cost for their "workers", and explicitly informs participants that they are recruited for participation in research (Palan & Schitter, 2018). Prior studies in different research areas have successfully used *Prolific* as a respondent pool, such as psychology (see (Margolis et al., 2019)), technology adoption (see (Abu-Salma et al., 2018)), or humanities and social issues (see (Doucerain et al., 2018)). *Prolific* has some subject management features, including 1) Payment rules, return options and rejection guidelines; 2) Pre-screening mechanism to ensure transparency about the population; 3) Options for exclusion of individual participants; 4) Options for longitudinal studies; and 5) Data Protection and Privacy policy. The second and third features are particularly relevant with this study because we need to select a sample which represents people who have experience in B2G information-sharing and come from both private and public organizations with a certain proportion. Using those two features, we targeted and selected respondents who we consider suitable for the research as well as to avoid poor quality responses.

In addition, this study's target population is people with B2G information-sharing experience from both private and public organizations. For the survey, we selected the respondents based on their experiences working with inter-organizational information-sharing, particularly B2G. However, this research was designed by taking into account and considering the organization's perception of information-sharing, especially businesses that carry out information-sharing with the government. So the point of view taken is the point of view of the organization, not the individual. Therefore, although the respondents for both qualitative and quantitative parts of this study are individuals, we assume that they are representations of their organizations.

Purposively random sampling was implemented in this research to find the people with enough knowledge of the information-sharing process. This method demands a representative sample from organizations having experience in B2G information-sharing. The sample covered parameters including types of organization, organization sizes, and different types of B2G information-sharing, and a wide range of industries. In detail, public organizations in this research can be Federal/State Government, Regional Government and Local Government. Private organizations in this research varied in terms of industry, country and size (SME, Multinational, and so on). A large sample was required because of the heterogeneous population. It also needed to reach higher accuracy, validity, and reliability because the data from the survey were later used to generalize the model. For this purpose, we decided to use an online platform as the survey dissemination channel. We realized that there are potential biases in

this research because of some reasons: 1) a respondent may act as the only representation of an organization; 2) difficulties in determining the number of respondents since we can only assume how big the population is; this may significant to ensure generalizability of our findings.

#### 2.2.3.1 Statistical Analysis

For the quantitative analysis, we conducted a two-stage analysis. The first stage used Exploratory Factor Analysis (EFA), and the second stage used Partial Least Square – Structural Equation Modeling (PLS-SEM). EFA was used in this study because of the need to test the variables. Taking into consideration that the measurement items adopted and combined from previous studies, and some were proposed for this research, are not necessarily fit together as a variable. Meanwhile, PLS-SEM is used as a statistical method to test the hypotheses in the model. These two methods are described in more detail in the next section.

1) Exploratory Factor Analysis (EFA)

EFA is useful in describing the configuration between the analyzed variables. Factor analysis, in general, delivers the mechanisms to analyze the configuration of the inter-related variables (Hair et al., 2006). A factor is a set of variables that are considered to have a high degree of correlation. These factors should represent the dimensions of the data collected. By performing factor analysis, there are two results that can be derived, namely: ascertaining the variables and identifying the underlying or hidden variables in the data. (Hair et al., 2006).

There are several assumptions regarding EFA. First, the sample size should be large enough (Costello & Osborne, 2005). As a generally accepted assumption, the number of observations per variable is as much as five observations per variable. When the research uses a (relatively) small sample size, the results of the analysis should be interpreted with caution (Hair et al., 2006). To ensure the first assumption, in preparing the analysis, KMO test was performed to check the sampling adequacy. Second, there must be a structure behind the set of variables. In other words, even if there are statistically correlated variables, there must be a conceptual logic in terms of concepts that logically relate to the analyzed variables (Yong & Pearce, 2013). In this study, the relationship between concepts, which aims to explain the structure and conceptual logic behind the set of variables (collected from prior research), is described in the chapter on model development (Chapter 5). Third, assumptions of normality and homogeneity of variance (Costello & Osborne, 2005). As stated previously in this section, it is also an assumption of the multiple discriminant variable. Bartlett's test of sphericity was performed to check the third assumption. Finally, the fourth assumption is the inter-correlation among the variables (Hair et al., 2006).

Furthermore, according to Hair et al. (2006) some problems may occur when conducting EFA, including: (1) a variable has no significant loadings; (2) even with a significant loading, a variable's communality is deemed too low; and (3) a variable has cross-loading indicators. To deal with those problems, several solutions suggested by Hair et al. (2006) are: 1) ignore problematic indicators and interpret the solution as is, although it may result in poorly formed variables; 2) consider possible deletion of variables, especially for less important variables and variables that have unacceptable communality value; 3) try alternative rotation method, for example, using oblique method if orthogonal had been used or vice versa; 4) decrease or increase the number of factors retained which is helpful to check whether a less or more factor structure can solve the problem or not. Since "over-

extraction and under-extraction of factors retained for rotation can have deleterious effects on the results" (Costello & Osborne, 2005, p. 2), we have to evaluate the number of variables retained for the model testing carefully.

Apart from grouped items per variable, based-on factor loading, another parameter in evaluating the quality of the variables is Cronbach's alpha for the reliability test. The accepted value of Cronbach's alpha in the management information system research is 0.7; however, values above 0.6 are also accepted (Hair et al., 2006; Taber, 2018). For this research, we accept variables with Cronbach's alpha value higher than 0.6. Using the above evaluating parameters, the results of EFA show which measurement indicators have to be removed and which to be retained for the next analysis, as well as how reliable the developed variables.

2) Partial Least Square – Structural Equation Modeling (PLS-SEM)

The quantitative part of this study aims to examine and analyze the relationship between exogenous and endogenous variables, as well as examine the validity and reliability of the instrument as a whole. Therefore, *structural equation modelling* (SEM) was used to test the data from the survey result. According to Hoyle (1995), SEM is a comprehensive statistical tool to test the relations among observed and latent variables. SEM provides the proper and most efficient estimation technique for a series of separate multiple regression equations estimated simultaneously. SEM can be used as a statistical technique to replace many conventional analytical tools. Research in understanding determinants behind technology adoption use SEM as their statistical tools, for example, trust and risk in e-government adoption (Bélanger & Carter, 2008), mobile computing in the healthcare industry (Wu et al., 2007), citizen attitude toward e-government adoption (Al-Hujran et al., 2015) and determinants of IT adoption in small business (Riemenschneider et al., 2003).

SEM differs from other standard statistical approaches in three fundamental ways (Hair et al., 2006). First is the ability to estimate and test multiple and interrelated dependence relationships. Second is the capacity to represent unobserved concepts in the relationship of latent variables and to measure the error in the estimation process. Third is the capability to define a model to explain the entire set of relationships. There are two types of SEM: Covariance-based SEM and Variance-based SEM. In this research, we were using the latter. According to Hair et al. (2019), PLS-SEM is an alternative approach that shifts from a covariance-based SEM approach to a variant-based approach and is well-suited for exploratory research. PLS-SEM analysis in this study was carried out using the SmartPLS ver.3.2.8.

(Ringle et al., 2012) explain that PLS-SEM has been used in IS research for many reasons. The main advantage of PLS-SEM is its ability to analyze "a complex model with many constructs, indicator variables, or structural path without imposing distributional assumptions of the data" (Hair et al., 2019, p. 3). PLS-SEM is useful when the analysis predicts the model that defines the latent variable as a linear aggregate of the indicators (Hair Jr et al., 2016). Three parameter estimates categories must be used to generate residual variance from endogenous variables. First, the weight estimation is used to create the latent variable score. Second, the path estimation is used to connect the latent variables as well as between latent variables and their indicators (loadings). Third, the means of indicators and latent variables (Hair Jr et al., 2016). Therefore, the PLS in this study was done using a three-stage iteration process. Each stage produced estimations for analysis. The first stage deals with the outer model analysis, the second stage with the inner model analysis, and the third stage with hypothesis testing.

The outer (or measurement) model aims to specify the relationship between latent variables and their indicators. In other words, the outer model defines how each indicator relates to its latent variable. The outer model analysis is conducted to ensure the reliability and validity of measured variables and provide support for their inclusion in the model for the inner (or structural) model analysis stage using three parameters: Convergent Validity, Discriminant Validity, and Reliability. Results of the outer model influence whether a latent variable is suitable to be included in the model evaluation (or inner model testing).

Parameters and the threshold value of each parameter used to evaluate the outer model, as suggested by (Hair Jr et al., 2016) is shown in Table 2-8. Part of the evaluation of the outer model is already done through EFA in the previous step, such as the loading factor and Cronbach's alpha of each latent variable. The results are more or less similar, although PLS requires a higher threshold, especially for the loading factor values. Moreover, Hair Jr et al. (2016) also suggest that the measurement model testing, which is carried out through either factor or path weighting scheme, can use an iteration value between 300 – 500, a stop criterion with a value of 7, and an initial weights value for all latent variables = 1.0.

**Table 2-8 Criteria for Outer Model Evaluation**

| Criteria | Parameter | Accepted Value |
|---|---|---|
| Convergent Validity | Loading Factor | ≥ 0,7 |
| | Average Variance Extracted (AVE) | > 0,5 |
| Discriminant Validity | Square root AVE & Correlation of Latent Variable | Square root AVE > LV*<br>(Discriminant Validity > 0,5 on one LV |
| Reliability | Composite Reliability | ≥ 0,7 |
| | Cronbach's Alpha | ≥ 0,6 |

The inner (or structural) model tells us about the relationships between exogenous and endogenous constructs. The inner model evaluation is used to ensure the robustness and accuracy of the structural model using bootstrapping. This study tested three parameters for the inner model: R2, f2, and Q2. To produce consistent results, the sample size used for bootstrapping, according to Hair Jr et al. (2016), is between 500 to 5000. The coefficient of determination, or R2, is the proportion of the variance in an endogenous construct that can be predicted from the exogenous constructs. Values greater than 0.670 are considered substantial, values between 0.333 to 0.670 are moderate, values between 0.190 to 0.333 are weak, and values below 0.190 are considered unsubstantial (Chin & Todd, 1995; Urbach & Ahlemann, 2010).

Another parameter to be used to evaluate whether a construct has a substantive effect on endogenous constructs is effect size or f2. This parameter evaluates the coefficient of determination value change when a predictor construct is removed from the model. The effect size values f2 0.02-0.15-0.35 each represent the small-medium-large effect of an exogenous latent construct to an endogenous latent construct. Values below 0.02 indicate no effect of the predictor constructs on endogenous constructs (Sarstedt et al., 2017). Furthermore, f2 values are considered as extra information about each predictor and its substantive effect on the dependent variable. Evaluating the statistical significance of the predictors in explaining the dependent variables can still be done even if the f-square value is not significant or small (Sarstedt et al., 2017).

# 3. Theoretical Foundations

The main objective of this research is to understand B2G information-sharing arrangements by investigating its system architecture and governance structure. We do this by considering the influence of *technological*, *organizational*, and *inter-organizational factors*. This chapter demonstrates the position of this research in the discipline of information systems. In this chapter, we provide the results of a structured literature review (SLR) about state-of-the-art knowledge in the B2G inter-organizational information-sharing domain. Then, we identify theoretical frameworks guiding this research in answering the questions. We cover inter-organizational information-sharing theory, B2G conceptualization of information-sharing arrangements, and factors influencing information-sharing arrangements. Findings from SLR, including relevant theories and the state-of-the-art, are useful to answer RQ1, RQ2, and RQ3, as shown in Figure 3-1.

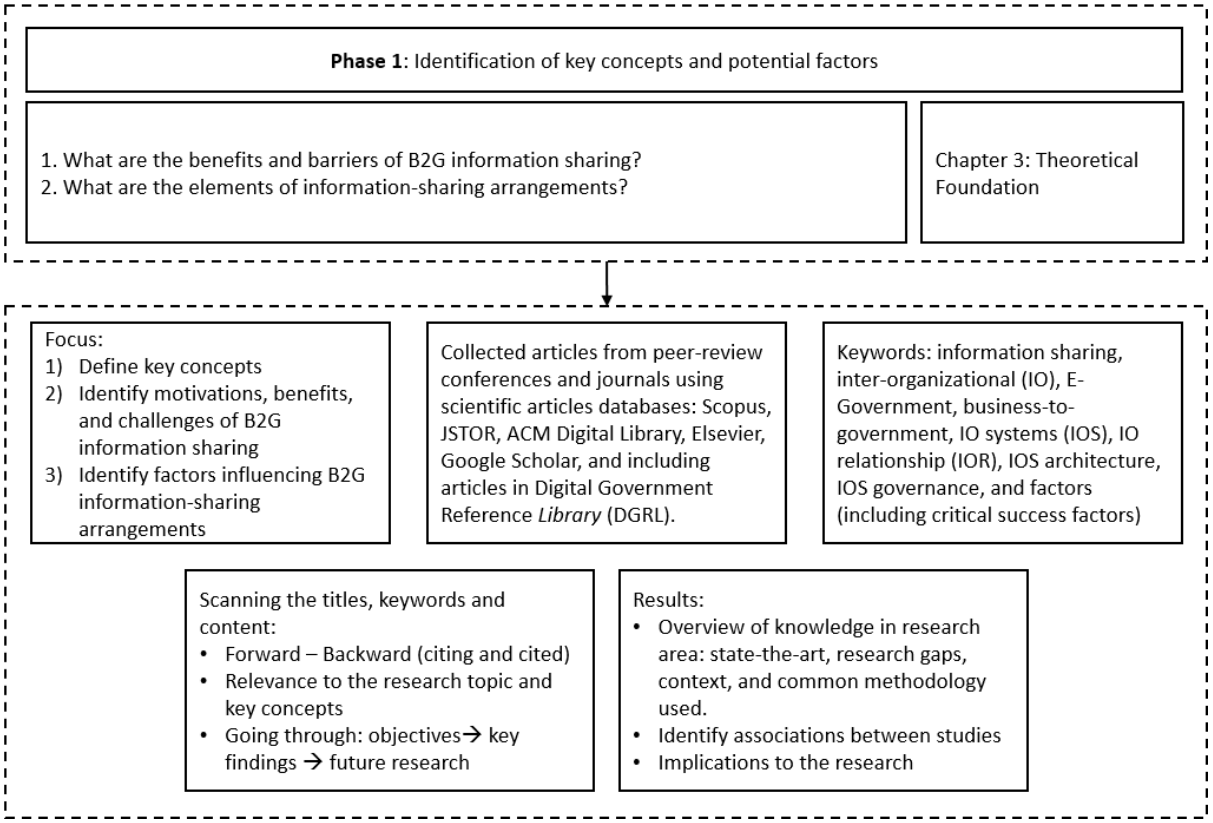


**Figure 3-1 Theoretical Foundations framework of this research**

## 3.1 Structured Literature Review Approach

This chapter starts with a discussion about inter-organizational information-sharing, in terms of its definition taken from prior research and potential motivations for information-sharing. We also review the scope of B2G information-sharing and identify the benefits as well as challenges perceived by businesses and governments when they decide to share information with others.

Second, we provide potential factors that influence B2G information-sharing. The factors were gathered from studies in the adoption and implementation of inter-organizational information-sharing

in many domains (mostly B2B and G2G) and varied sectors (including financial reporting, cyber-security, public service networks, healthcare, and logistics). Those studies usually refer to technology adoption models such as the Diffusion of Innovations (DoI) model, the DeLone and McLean model, the Technological-Organizational-Environmental (TOE) model, or the Technology Acceptance Model (TAM). In addition, we also found some articles discussing methods and mechanisms to share information; some of these studies also provide the determinants of selected methods.

Third, we explore relevant theories in the literature to determine design variables that capture the typical *architecture* of B2G information-sharing systems. We reviewed the literature on inter-organizational (or cross-boundary) information-sharing, E-government, and inter-organizational systems to get insights into how the data is shared between organizations, specifically between companies and government agencies. This leads to a conceptualization of variables used to define a B2G information-sharing system architecture.

Finally, we review the literature on inter-organizational *governance* structures; discuss the various types of governance structures, including the definition of governance, its characteristics, and how governance plays a role in the adoption of information-sharing systems. This leads to a conceptualization of governance in B2G information-sharing and its main dimensions.

## 3.2 Theory of Information-sharing

### 3.2.1 Definition of information-sharing

The amount of digital data generated by digital processes, social media, smart systems, mobile phones, and sensors around us is growing fast (Hota et al., 2015). More and more data is collected and analyzed by organizations to derive insights, including understanding their customer's behavior or enabling better decision-making (Pettit, 2017). Organizations can rely on their internal data in dealing with the data-driven world or may also collect data externally. Information-sharing with other public organizations or businesses and citizens is needed for the latter.

What is information-sharing? Data, information, and knowledge may be used interchangeably in practices, so making a clear distinction between those terms can be tricky (Davenport & Prusak, 1997). To tackle this issue, we take the view from Ackoff (1989) in explaining the hierarchical explanation from data to wisdom, called Data-Information-Knowledge-Wisdom (DIKW) hierarchy model.

While the DIKW model is used as a reference in this study, we also pay attention to its criticisms. As Weinberger (2010) stated, *"the real problem with the DIKW pyramid is that it's a pyramid. The image that knowledge (much less wisdom) results from applying finer-grained filters at each level, paints the wrong picture. That view is natural to the Information Age, which has been all about filtering noise, reducing the flow to what is clean, clear and manageable. Knowledge is more creative, messier, harder won, and far more discontinuous"* (p.3). As a model, the main critique towards the DIKW is about its hierarchy structure; it offers a too simplistic way to provide a representation of interaction and relationship between data and information, which are much clearer compared to information to knowledge, let alone from knowledge to wisdom (Frické, 2009). Graves (2012) argued that the model might be better explained if it is run backward. Therefore, it should start with an understanding of how the phenomena works (W-dimension), explain it in social truth (KW-dimension), after that presenting it with a conceptual framework (IKW-dimension), and finally, use the conceptual framework to select and filter facts from the real-world to determine which are relevant and which are not (DIKW-

dimension). Nevertheless, the DIKW model is useful because it shows the relationship between data, information, knowledge, and wisdom as it is necessary to understand the distinction between them.

*Data* are "streams of raw facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use" (Laudon et al., 2012, p. 15). Data can also be defined as symbols, the products of observation (Ackoff, 1989; Rowley, 2007). Next, *information* is data that is processed or interpreted. Information answers questions about who, what, where, and when (Ackoff, 1989). In other words, information is data that has been processed into a form that is meaningful, useful, and understandable to human beings (Laudon et al., 2012).

*Knowledge* refers to the use of data and information and is directed to answer the "how" questions. Knowledge can be interpreted as the result of learning (Pilerot, 2012) or aligning with previous terms as the result that comes after understanding the information (Kendal & Creen, 2007). Knowledge is also considered as a process or a collection of information so that it can be useful intentionally (Rowley, 2007). There are two types of knowledge: tacit and explicit. Tacit knowledge is a type of knowledge that is difficult to document in the form of subjective or experience-based knowledge. In contrast, explicit knowledge is a type of knowledge that can be documented (Laudon et al., 2012; Yang & Wu, 2013).

If data, information, and knowledge deal with something that is and has happened or known, *wisdom* is related to the future since it indicates design and vision. With wisdom, one can estimate or predict what will happen in the future, considering past and present experiences or situations and visions and future targets (Ackoff, 1989; Rowley, 2007). In contrast to knowledge, wisdom is considered an extrapolated, non-deterministic, and non-probabilistic process that may provide an understanding of something that previously lacked or did not understand (Rowley, 2007). Wisdom is considered more difficult to be formulated and out of the reach of current artificial intelligence (AI). Wisdom is assumed as a human-specific level and non-achievable for computers or machines due to the lack of "soul" (Braga & Logan, 2017).

Based on the definition, in this research, we are using 'information-sharing' instead of 'data sharing' or 'knowledge sharing'. "Data sharing" refers to the ability to exchange the same sets of data with multiple applications, systems, or users while maintaining conformity to the same standard across all entities consuming the data (Baum, 2022). This term is more technical in nature and can be useful to describe the basic activity level but may not deal with the understandability and interpretability of the data. On the other hand, "knowledge-sharing" is about the learning process. According to Pilerot (2012), the discussion related to knowledge sharing shows that what is being researched and investigated is how people carry out learning activities together rather than how they share knowledge. Therefore, the term knowledge-sharing is not suitable for this research. Therefore, information-sharing is used, to indicate that the shared data must be pre-processed, organized, and put into a certain structure or format, to ensure the receivers (or requesters) have the same interpretation as the senders (or providers), otherwise it might limit the realization of expected benefits.

Information-sharing falls under the umbrella of information behavior, including other activities such as information use, transaction, information seek, and information avoidance (Pilerot, 2012). Various definitions of information-sharing can be found in the information system research domain. As can be seen in Table 3-1, there exists a diversity of definitions, from simple to detailed, including providing objectives and requirements and methods used to share information.

**Table 3-1 Definition of Information-sharing from literature**

| Information-sharing definitions | Sources |
|---|---|
| "The voluntary act of making information available to others" | (Davenport & Prusak, 1997; Jarvenpaa & Staples, 2000; Pardo et al., 2010) |
| "Exchanging information between and across government agencies or otherwise giving them access to information" | (Dawes, 1996, p. 382) |
| "The mutual sharing of business and market information between exchange partners" | (Wu, 2008, p. 123) |
| "The common stewardship of information through the acts of partnering, dissemination, and fusion, with the objectives of shared understanding, consistent decision-making, and coordinated action to achieve collaborative goals" | (Crowther, 2014, p. 4) |
| "The collaboration or interconnection of different information systems or telecommunication technologies to share data with common conceptual scheme between entities such as groups, departments or organizations" | (Yang & Wu, 2014, p. 638) |
| "The making available of information to one or multiple other entities (people, systems or organizational units)" | (van Engelenburg, 2019, p. 27) |

The first definition is a very basic definition of information-sharing. By its nature, sharing activity, which according to the Merriam-Webster dictionary means "*taking part in, using, experiencing, occupying, or enjoying something with another person*", is usually done voluntarily and with full consent of the owner of what is being shared. This definition is usually used in starting the discussion of information-sharing in prior research. The other definitions go into more detail and are more suitable to the context of the research, as they take the domain into account. The second and third definitions address information-sharing in the scope of government-to-government and B2G information-sharing, respectively. As an example, the fourth and fifth definitions provide the scope of information-sharing, from information level to information system level. Crowther's definition also provides an overview of the sharing mechanism through information partnerships, dissemination, or fusion; van Engelenburg (2019) then generalizes it using the phrase "making available of information".

In addition, Zheng et al. (2009) proposed a framework containing a comprehensive description of information-sharing boundaries. There are two dimensions of boundary in cross-boundary information-sharing: vertical and horizontal. In the vertical dimension, there are four boundaries to be crossed to implement cross-boundary information-sharing, which are the hierarchical boundary, the personal boundary, the geographic boundary, and the development level boundary. This vertical boundary exists in government agencies, from local to regional to federal levels (Ma et al., 2020; Yang et al., 2012), or in a holding company, in which subsidiaries, as well as regional branches, share information with the headquarter (Rahimi & Møller, 2013). On the other hand, in the horizontal dimension, there are six possible boundaries: the departmental boundary, the personal boundary, the process boundary, the development level boundary, the geographic boundary, and the sector boundary. Examples of this boundary is information-sharing between government agencies and private sectors, between municipalities, or between companies.

As this research focuses on B2G information-sharing through information systems, we adopt key aspects from the definitions mentioned above. B2G information-sharing should have public interest

purposes and can be voluntary (Peng, 2015; Rukanova, Ubacht, et al., 2021) or compulsory (Arruñada, 2011; Shan et al., 2016). B2G information-sharing can be considered horizontal cross-boundary information-sharing. B2G information-sharing can be done using pull and push mechanisms, either making the information available to others or sending the required information to others. Therefore, as already mentioned in the introduction (particularly 1.1), B2G information-sharing in this study is defined as: "*The process of exchanging data, by making data available to be accessed by others or by sending and submitting data to others, between governments and businesses through specific information systems and typically based on mutual agreements among the organizations involved for specific purposes*."

What kind of information could be shared? The data type to be shared can depend on the purpose, domain, timing, and participants (Institute of Medicine, 2014). In many cases, the raw data (such as statistics, observations of customers, patients, income data, and expense data of organization) could be shared. Still, usually, data is exchanged in the form of reports. Suppose organizations decide to share the raw data. In that case, it must be complemented with its metadata so the recipients can understand and correctly interpret the shared data (Zuiderwijk et al., 2012).

Furthermore, according to Jones and Parker (2019) as shown in Figure 3-2, the scope of information-sharing, generally, is data related to reports, operations, and statistics. Data to be shared should have the potential to provide added value and encourage innovation for organizations participating in the initiative. Information related to confidential decisions and operations that affect the organization's business performance and provide competitive advantage should not be shared with other organizations. If necessary, information should only be shared with a closed group of partners using data protection technology. The combination of statistical data and datasets that have the potential to provide value for organizations and society is included in the common open data category. Next, private data (customer data managed by the organization) could be shared, but must be adjusted to applicable laws and regulations and fully consented.

The next category is strategic data related to decisions that can create value for the organization if it is disseminated, for example, to improve the organization's public image. Operational data could potentially be shared, especially information that can be useful for other organizations, such as related to cyber-attacks. This includes operational information which, if shared with the government, can help to provide solutions for societal issues. Finally, public data, statistical data, and policy reports can be widely shared with outside parties, preferably in the form of open data. The term 'open data' refers to data that is directly accessible by the public (Janssen et al., 2012).

The value of data can be dependent on context, time or situation (Rukanova, Tan, et al., 2021). Data that are valuable for a company may not have some value for other companies (for example, in different industries). Even in an organization, data value can differ for different units. The value of the data might also be aligned with data classifications (Park et al., 2016), which in many organizations are the data owner's responsibility (Malisow, 2020). Data classified as restricted or confidential may relate to its value, which, if compromised or leaked, could negatively affect or even put the organization at financial or legal risks. However, some data can be perceived as valuable in general, for example, personally identified information (PII) addressed by laws or regulations.

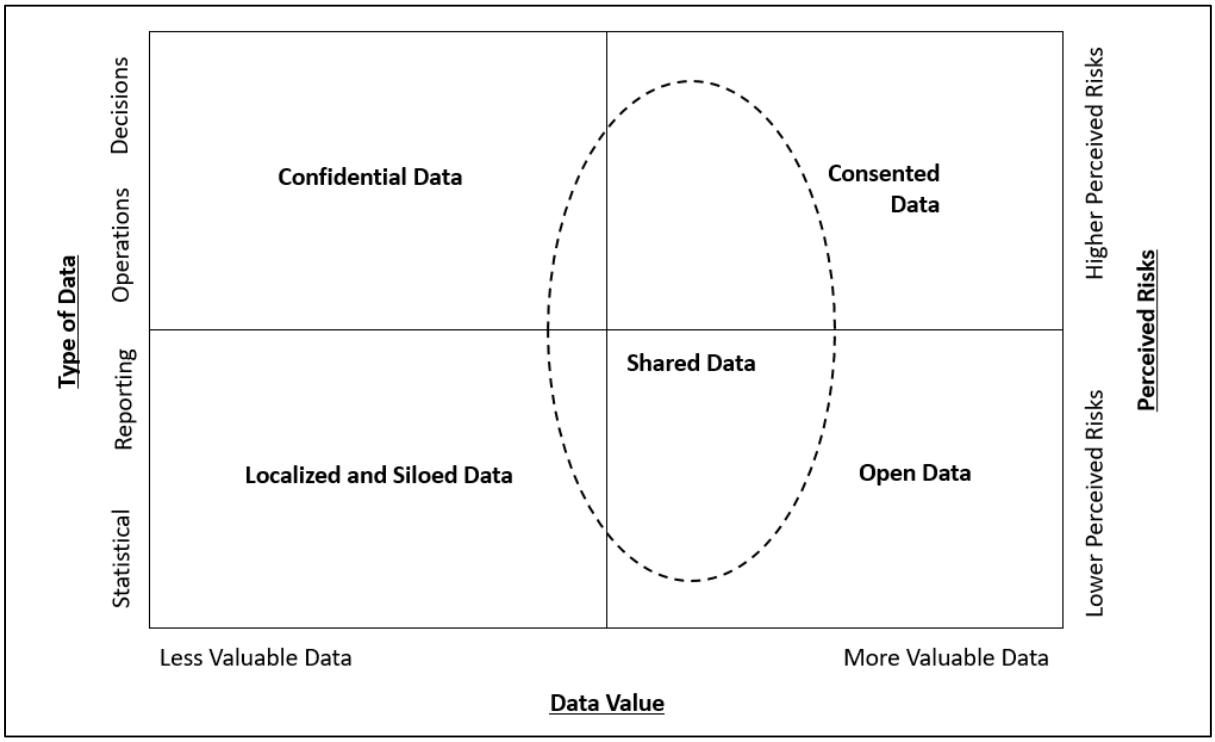


**Figure 3-2 Positioning of information-sharing by type of data and data value (adopted from Jones and Parker (2019, p. 3))**

### 3.2.2 Government and Business Relationship

The application by an entrepreneur for a business license is often the first step in the relationship between a company and the government. Next, a company might need to file tax information to the Tax Office, provide accounting information to the Chamber of Commerce, and so on. One of the primary tasks of the government is to monitor and safeguard the market. The government issued a regulation requiring companies to disclose information as evidence that they comply with applicable laws and regulations.

The information required by governments is mainly related to financial information (Bharosa, Janssen, Klievink, et al., 2013) that is used, for example, for taxing and accounting purposes (Bonsón et al., 2009). In some cases, information on how the companies operate can also be shared. Examples include information about the type of cyber-attacks they experienced and how they deal with that (Zibak & Simpson, 2019), social and environmental impacts and risks from the company's activities (Ramos et al., 2013), length and location of the developed optical cables (Gómez-Barroso & Feijóo, 2010), or the number of intensive care rooms available at the hospital (Faber et al., 2017). Statistical data are also a type of data usually required to be provided by companies to governments (Gil-Garcia & Sayogo, 2016). Governments mainly use those data to reduce societal risks and maintain financial and social stability (Bharosa, Janssen, van Wijk, et al., 2013). Also, data for inspection and compliance purposes is often requires, like by customer or food inspection agencies.

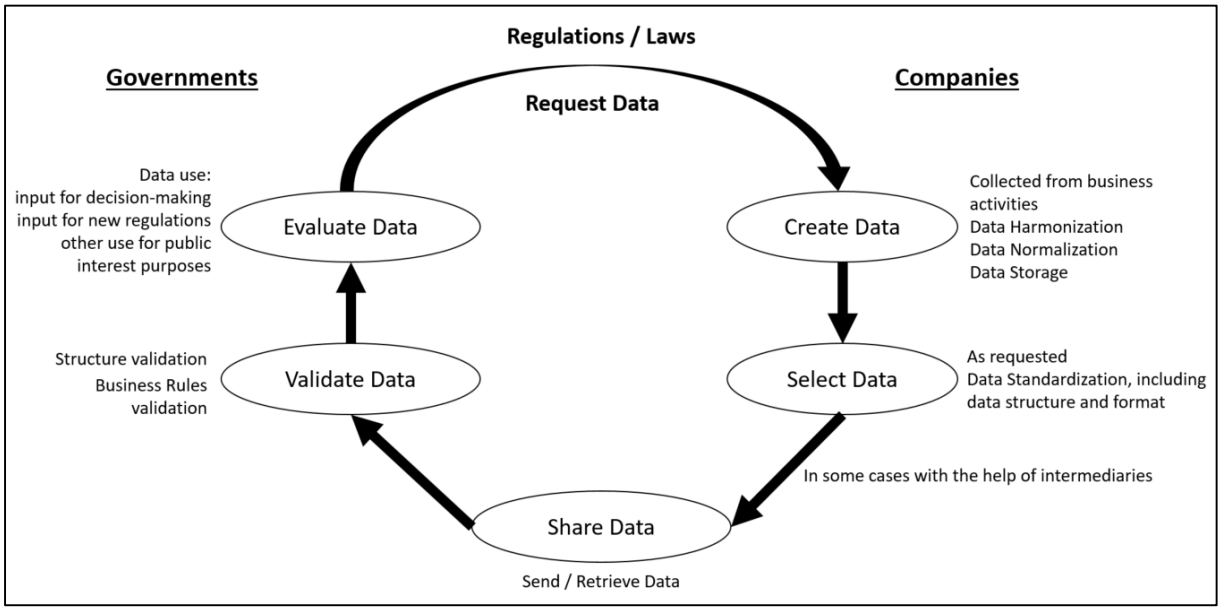


**Figure 3-3 Information Chain for Regulatory Compliance (adopted from Matheus et al. (2018))**

Matheus et al. (2018) provided an example of information shared in B2G context, as shown in Figure 3-3. An information chain can be defined as "end-to-end process that starts with original data sources, creates information and continues through to the use of information in operations, decision-making, and planning" (Muka, 2015, p. 10). Governments are in need of certain data or reports from companies. For example, balance sheets, income, or cash flow statements from companies. For that purpose, government agencies issue regulations to ensure companies fulfill information-sharing. The regulation stated requirements about the format and structure of required data, methods to submit data, and other responsibilities for the government and companies. Internally, the company should identify, collect, and select the required data and prepare the reports in accordance with the requirements. If needed, some additional work may be done to modify the format or structure into the required data format and structure. Then, the company has to submit the data through the predefined application. The government then receives the data, and starts to process it, including if the shared data have followed the required structure and the data is in accordance with regulations. Last, the shared data can be used for creating societal value, including improving public services or policy-making.

In addition, government agencies and companies have also collaborated and shared information for other purposes. According to a study from Van Der Meer (2014), there are four different models for business and government collaborations based on four attributes, e.g., leadership, relationship format, length of the relationship, and the range of information-sharing. Those four models are summarized in Table 3-2.

In the first model, local government and companies form a formal project-based partnership called *corporate management*. For example, developing a Geographic Information System (GIS) to provide government and business partners evidence to make better decisions on land use, especially for public infrastructure and business development needs (Van Der Meer, 2014). The corporate management model can be considered a hybrid version combining business development with community development. For this model, involvement from participants is encouraged for government and companies, because the benefits to be achieved are distributed to the government and private parties.

Limited information-sharing means that the shared data are project-specific data. With the dedicated person-in-charge in each organization, the information-sharing is carried out through those authorized users to submit and receive data to and from partners.

**Table 3-2 Model of business and government collaboration which requires information-sharing**

| Attribute | Model | | | |
|---|---|---|---|---|
| | **Corporate Management** | **Business Development** | **Community Development** | **Inter-organizational Network** |
| Leadership | Joint | Joint | Government | Variable |
| Relationship | Formal | Formal | Informal, Formal | Ad-hoc, Formal |
| Length of Relationship | Project-specific | Project-specific or ongoing | Project specific or ongoing | Ongoing |
| Level of information-sharing | Limited | Limited | Limited | Multilevel |

The objective of the second model is directed to the potential business opportunities from the collaboration of governments and private sectors; that is why it is called *business development*. Examples of this model include many PPP implementations. For example, developing and operating new highway lines or high-speed railway, and developing areas for tourism (Van Der Meer, 2014). Unlike the previous model, although it is designed to be managed jointly, the role of government in this model may be slightly more limited than the role of business.

The next model is *community development*. This model focuses on the growth and development of the entire local or regional community. An example of this model includes the development of regional growth agreements or modern village management. In this model, government agencies with citizens are predominant in developing the programs and decision-making as the private sector plays a role in supporting stakeholders. This model is better suited for NGOs (non-governmental organizations) or as corporate social responsibility (CRS) distribution scheme (Van Der Meer, 2014).

The final model is the *inter-organizational network*. This model acts as a network of affiliates (Manring et al. 2003; Manring and Pearsall 2004). The main characteristic of this model is building an ad-hoc alliance to enable the members to collaborate for specific purposes (Manring and Moore 2006). The leadership role divided over each member depends on their expertise (Manring and Pearsall 2004). Inter-organizational networks also involve multilevel interaction and information-sharing. An example of this model is an international sports event, a World Cup or the Olympics. In such events, committees created joint information management when participants, volunteers, and workers receive updated information daily (or even on real-time) to improve their decision-making which is sometimes time-critical.

Moreover, the EU has published a document of guidance on sharing private-sector data in the European data economy to stimulate information-sharing between businesses and government to increase value creation by exploiting private-sector data. In the guidance, the EU suggests 5 models of B2G information-sharing (European-Commission, 2018):

1) *Data donorship*; in this model, usually for research or educational purposes, private companies give access to their data to external parties. Usually, data donorship is included as part of the corporate social responsibility of businesses (Stempeck, 2014). An important note related to this

model is that the transfer of ownership of the data should not be done at the expense of protecting the basic rights of the data subject (Micheli, 2022).

2) *Prizes*; in this model, public organizations provided *incentives* to encourage private companies to share their data to address public interest challenges. Research funds that require collaboration between various organizations, including universities, research centers, local governments, and private companies, are examples of this model. Commitment to providing data access to the team can be a potential issue, which should have been discussed and agreed upon through a research agreement, including the type of sanctions for violations committed (Verhulst & Sangokoya, 2014).
3) *Data partnerships*; this model represents a common model of B2G information-sharing (Susha et al., 2019). In this model, public organizations can arrange information-sharing with private companies. Ideally, not only private companies' data is being shared, but public organizations' data are also accessible for exchange (with limitations such as PSI Directive or Private Data laws). Therefore, insights can be obtained by linking, contrasting, combining, and making correlations of data from various sources (European-Commission, 2018).
4) *Intermediaries*; in this model, a third party can be assigned to facilitate information-sharing. This model may be preferred in situations having low levels of trust or no prior collaboration among participants of information-sharing (European-Commission, 2018). Several actors can be the intermediaries, including data-driven start-ups, consultants, universities, and information-sharing platforms. In practice, they can assist in legal support, providing technical solutions, or any other activities that cannot be handled by the main actors (Micheli, 2022).
5) *Civic data sharing*; in this model, citizens or individuals are the ones who initiate B2G information-sharing by permitting public organizations to obtain, process and use their data that was previously under the control of private companies (European-Commission, 2018). This model is most likely to work when there is a high-level of trust of citizens in the governments or when the purpose is very relevant to the situation experienced by citizens and requires a quick response (European-Commission, 2018).

Several legal and practical aspects should be considered for B2G information-sharing according to EU (European-Commission, 2018). First, the public interest purpose, the required data, and the level of data quality required must be defined, identified, and communicated as early as possible. This first aspect is critical to increasing the possibility of benefits realization while mitigating potential risks and costs due to additional work for data processing or data used by unauthorized users. Second, all involved parties should identify internal organizational challenges that could hinder information-sharing. For example, implementing a certain level of data quality or new data standards may cause organizations to modify their internal systems or require employee training. Third, contractual agreements between organizations may be critical. The contract should include how to safeguard the data, technical and practical modalities for information-sharing, conditions for implementation, guiding principles for implementation and evaluation of information-sharing, applicable laws and dispute settlement mechanisms, and rules on liability for activities that may cause problems. Last, provide mechanisms and encourage public feedback by disseminating the insights and findings from the shared data. EU underlines that all those considerations are open to and should be negotiated by all involved participants to avoid lower quality, less effective and efficient, and potential conflicts during information-sharing.

EU guideline also provides the technical aspects of B2G information-sharing, especially to establish a secure environment. There are three options provided in the guidelines (European-Commission, 2018):

1) Using a data platform that can provide a secure environment and implement standardized data on B2G information-sharing.
2) Algorithm-to-the-data can also be used as a solution for creating an environment that supports security, data protection, and privacy.
3) Another option is the use of privacy-preserving computations, which can create computational models that can perform data processing without interfering with the confidentiality of the data.

### 3.2.3 Why do businesses share information with the government?

The study by Yang and Wu (2013) analyzed the implementation of interagency information-sharing in public sectors and identified seven purposes: administrative work, information search and verification, information aggregation, business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency. Those purposes enable government agencies to execute their core business efficiently. From the research findings, Yang and Wu (2013) explained that three purposes, including information search and verification, information aggregation, and business process chain, are critical to support administrative work in a cross-boundary information-sharing. The research also suggests promoting innovative services as the main purpose for implementing cross-boundary information-sharing aims to create public value.

Similar to Yang and Wu (2013), research from Bharosa et al. (2015) provided three dimensions of information-sharing, which have government involvement: reporting, transaction, and policy development. Reporting perspective requires organizations to provide information to justify their activities. This information is usually sent by organizations regularly, for example, monthly or yearly. The transaction perspective requires organizations to provide information to finalize the transaction process, for example invoicing in the e-procurement process. The policy development perspective requires organizations to provide information that allows public agencies to create new policies or determine the effectiveness of their existing policies.

Prior studies also show that initiatives to share information with others can be caused by more than one motivation (Ikeya et al., 2010; Yang & Wu, 2013). These motivations can be related to the expected benefits from information-sharing addressed in the next section.

### 3.2.4 Benefits of B2G information-sharing

As explained in the previous section, most of the implementation of B2G information-sharing aims to improve public services and addressing societal problems while bringing benefits to organizations. This section addresses the benefits of B2G information-sharing collected from prior studies in various domains and sectors. In addition, as one form of inter-organizational information-sharing, the benefits for B2G could be similar to other forms, such as government-to-government (G2G) or business-to-business (B2B). Apart from articles on B2G, we also collect potential benefits from articles discussing inter-organizational information-sharing in general and other forms.

Adequate information to be shared among collaborating parties is one of the requirements of effective inter-organizational collaboration (Sandberg, 2007). In supply chain management,

information-sharing can be used to improve production planning, inventory, performance, sales data, and product delivery, and results in better collaboration (Baba et al., 2021; Olorunniwo & Li, 2010). Lotfi et al. (2013) showed that the lack of information-sharing results in uncoordinated actions between organizations. How does information-sharing improve collaboration? According to Singh et al. (2019), information asymmetry among partners is reduced to bring partners to the same level of understanding. Actively sharing information also increases the intensity of communication between partners (Gordon et al., 2015; Olorunniwo & Li, 2010), for example, to discuss insights from the shared data. As an impact in collaboration potentially felt by many (if not all) involved parties (Malepati et al., 2007), accordingly, any improvement in collaboration would be perceived by both government and private organizations which are joining the initiative.

Information-sharing can also improve information quality. More and varied data that is shared digitally and comes from various sources would allow organizations to access more complete and comprehensive information (Bharosa, Janssen, van Wijk, et al., 2013). Complete in terms of the amount and required data that are shared, while comprehensive represents the level of detail provided in the shared data (Yang & Wu, 2015). Moreover, the adoption of data standards with an agreed format, structure, and level of granularity, for example, using XBRL or XML, can also increase information accuracy, consistency, and make it easier to interpret and process the shared data (Baldwin & Trinkle, 2011; Bharosa, Janssen, van Wijk, et al., 2013). An effective information-sharing is also potentially improve other information quality parameters such as relevancy, timeliness, or reliability (Yang & Wu, 2015). In B2G information-sharing, the government especially perceives this benefit as the requesting party. The preparation of data according to the required quality level can be a challenge for the information provider (Sayogo & Gil-Garcia, 2014; Scholl et al., 2012; Yang & Maxwell, 2011), especially for companies with limited resources or low IT capability. However, when the information provider can provide quality information using their internal systems, this benefit could also be realized by the information provider.

Next, information-sharing is important in improving decision-making in many areas, such as financial (Asadi, 2014), healthcare (Wimmer et al., 2016), cyber-security (Gordon et al., 2015), or emergency response management (Uitdewilligen & Waller, 2018). Decisions in this regard are not only related to the societal issues addressed by information-sharing but also to the internal organization (Asadi, 2014). For example, information from the International Olympics Committee (IOC) can be used by media partners in allocating their journalists to do coverage at the right venue and schedule, while IOC can use information from media partners to allocate a proper number of journalists' access to certain venues. The speed and magnitude of data acquisition obtained from various sources are the main reasons for the importance of information-sharing in decision-making (Asadi, 2014; Crowther, 2014). The uncertainty of the level of data quality, especially interpretability and understandability from the adoption of data standardization (Perdana, 2013) and coupled with the clarity of the roles and responsibilities (Crowther, 2014; Sayogo et al., 2016) of the parties that participate in information-sharing activities are also found to influence the effectiveness of information-sharing related to decision-making.

According to Nurmilaakso and Kauremaa (2012), when the frequency of data exchange increases and more organizations join, the investment in developing an information-sharing system will be easier to return. In addition, (Yigitbasioglu, 2010) conclude that information-sharing is useful for lowering transaction cost, particularly coordination cost. First, using digital means and proposing certain data from partners according to its importance and necessity in information-sharing can reduce search and

information costs (Bharosa, Janssen, van Wijk, et al., 2013). Second, effective information-sharing can help to solve a problem known as the *bullwhip effect*, which occurs due to uncertainty in demand and is one of the causes of inefficiency in the supply chain (Yigitbasioglu, 2010). Moreover, the use of standardization, in data particularly, can reduce processing costs (Chowdhuri et al., 2014). Using an integrated information-sharing system that can facilitate one-to-many and system-to-system information-sharing, a company can submit data to many government agencies "automatically" (or with certain access level), can also be useful in reducing the transaction cost. Data is prepared in a more efficient and effective manner (Bharosa, Janssen, van Wijk, et al., 2013).

Another benefit of information-sharing is the creation of transparency among participants and with the public (Chen, 2012; Gil-Garcia et al., 2009; Piechocki et al., 2009). Access to information is considered a critical aspect of promoting transparency (Janssen et al., 2012; Susha et al., 2015). Access to the companies' data or private data managed by companies becomes a possibility to analyze the policies of public bodies that are important in creating policy transparency (Zuiderwijk et al., 2012), however, it is still necessary to have a certain level of data quality (Batini & Scannapieco, 2016; Zuiderwijk et al., 2015). The increased level of transparency could also stem from, for example, an obligation to publish insights, results, or best practices from the shared data (without compromising data confidentiality) and acknowledge contributions from all parties involved (Chen, 2013).

Following an increased level of transparency, the level of accountability may also be improved by information-sharing. In an inter-organizational network involving many actors, it might be unclear which organization is responsible for a certain activity (Janssen, 2007). For example, ensuring which organization is responsible for maintaining the performance of information-sharing systems, managing relationships between sharing participants, ensuring there are no data leaks throughout the information chain, or ensuring the publication of insights from shared data to the public; and this could potentially cast doubt on decisions or actions made based on information-sharing (Hulstijn, 2015). In addition, granting public access to private data or company data can also be considered a form of public participation. In this way, the public can hold them accountable (Matheus et al., 2018). Similar to how information-sharing increases transparency, the governance of information-sharing plays a critical role in realizing these benefits (Bharosa et al., 2018; Chatterjee & Ravichandran, 2013). Having agreements with participants stating roles and responsibilities of each participant, how decisions are made for the information-sharing, what kind of data to be shared, and the level of data quality are governance aspects that can help to improve accountability of the information-sharing processes (Bharosa et al., 2018).

Another expected benefit from B2G information-sharing is the improvement of compliance. Compliance means acting in accordance with applicable laws and regulations (Bharosa, Janssen, van Wijk, et al., 2013). Compliance with regulations demonstrates the organization's purpose in ensuring that they are aware of and take steps to comply with relevant laws, policies and regulations (Sadiq & Governatori, 2010). Some instruments are critical for compliance monitoring, reporting, and assessment. In reporting, companies provide data showing that they comply with relevant laws and regulations to certain government agencies. The compliance assessment deals with the collection and analysis of the shared information to check and determine whether companies are operating in accordance with applicable laws and regulations (Perdana et al., 2014). The encouragement and establishment of information-sharing and cooperation between companies and government agencies also mean that providing a support system can directly facilitate the fulfilment of reporting evidence. The development of effective and efficient reporting mechanisms is critical in improving compliance

in terms of the quality of reports and the amount and variety of reported information (Bharosa, van Wijk, et al., 2011). For example, with the implementation of digital information-sharing with embedding compliance-by-design into the system (Bharosa, Janssen, van Wijk, et al., 2013), adoption of data standards (Pinsker & Li, 2008), defining required data, automating several pre-defined processes, and involving many government agencies to be part of information-sharing initiatives.

Next to goals like reducing transaction costs and improving compliance, B2G information-sharing can also lead to administrative burden reduction. Administrative burden can be defined as "*the cost to business of carrying out administrative activities that they would not carry out in the absence of the regulation, but that they have to undertake in order to comply with it*" (NAO UK, 2008, p.4). The more activities that companies carry out, and the more aspects that the government must monitor, the more laws and regulations companies must follow (Bharosa, Janssen, Klievink, et al., 2013). This is especially the case in high-risk industrial sectors such as healthcare, finance, pharmaceuticals, and food processing to reduce social risk (Bharosa, Janssen, van Wijk, et al., 2013). However, stricter laws and regulations have side effects for both government agencies and companies. For government agencies, more laws and regulations demand more compliance monitoring capabilities and resources to collect and process information which often results in too much focus on inspection activities and less on compliance monitoring. For companies, more laws and regulations often result in higher compliance costs — time and money spent to prepare the reports required by multiple government agencies (Bharosa, Janssen, Klievink, et al., 2013; Bharosa, Janssen, van Wijk, et al., 2013). So how can information-sharing help to reduce administrative burdens? Adopting digital means in the reporting process can help to reduce red tape (Yang et al., 2014), especially if it is built in an integrated manner, accommodates reporting to many government agencies, is ease to use and implement, and allows data reuse with the intended use purpose based on regulations or laws (Bharosa, Janssen, et al., 2011).

From all benefits addressed by prior studies, it can be concluded that there is a relationship between these benefits. The achievement of one can influence the achievement of other benefits. Moreover, with the increasing variety and quality of the shared data and the increasing frequency of information-sharing, coupled with the increasing number of organizations joining information-sharing, more benefits could be obtained. Prior studies have also identified benefits that can only be realized with certain conditions, requirements, or settings (Juell-Skielse et al., 2017; Romochkina et al., 2016). For example, if information-sharing aims to increase operational efficiency and reduce costs, then sharing should be done through a shared hub architecture (Romochkina et al., 2016).

In addition, apart from those "common" benefits, we also identified benefits that are typical for certain domains. For example, financial fraud detection, reducing tax avoidance, and reducing shadow economy are benefits of financial information-sharing (Knobel, 2017). Other specific benefits of inter-organizational information-sharing include combating cyber threats, supporting breach detection, incident responses, reducing damage caused by a breach, or supporting defensive agility and resilience (Zibak & Simpson, 2019).

Table 3-3 shows an overview of the benefits. However, although many of the benefits are addressed for both public and private organizations, there are specific benefits for governments or for businesses. Based on the literature, in B2G settings, governments are expected to get more benefits from information-sharing than businesses. This imbalance of benefits might add to the unwillingness of businesses to share information. Therefore, understanding information-sharing arrangements could be a solution to ensure benefits realization or to target a particular benefit.

**Table 3-3 Benefits of B2G information-sharing**

| Benefits | Source | Perceived by | |
|---|---|---|---|
| | | Government | Business |
| Improve collaboration | (Calo et al., 2012; Dawes, 1996; Landsbergen Jr & Wolken Jr, 2001) | √ | √ |
| Reduce administrative burden | (Calo et al., 2012; Janssen & Tan, 2014; Raus et al., 2010; Winne et al., 2011) | | √ |
| Accelerate the processing of information | (Klievink et al., 2012b; Prajogo & Olhager, 2012) | √ | |
| Improve information quality | (Crowther, 2014; Gil-García et al., 2007; Janssen & Tan, 2014; Popovič et al., 2014; Zhang et al., 2005) | √ | |
| Improve public services | (Bharosa, Janssen, van Wijk, et al., 2013; Calo et al., 2012; Gil-García et al., 2007; Landsbergen Jr & Wolken Jr, 2001; Zheng et al., 2009) | √ | |
| Improve accountability | (Dawes, 1996; Janssen & Tan, 2014; Winne et al., 2011; Zhang et al., 2005) | √ | √ |
| Improve decision-making | (Calo et al., 2012; Dawes, 1996; Janssen & Tan, 2014) | √ | |
| Cost efficiency | (Badri & Alshare, 2008; Calo et al., 2012; Chengalur-Smith et al., 2012; Dawes, 1996) | √ | √ |
| Improve transparency | (Calo et al., 2012; Gil-Garcia et al., 2009) | √ | |
| Improve compliance | (Aviram & Tor, 2003; Bharosa, Janssen, van Wijk, et al., 2013; Chen, 2012) | | √ |

### 3.2.5 Barriers to B2G information-sharing

Apart from the expected benefits from information-sharing, prior research has also provided barriers to information-sharing, as shown in Table 3-4. Addressing those barriers has been considered critical for the success of information-sharing. We grouped the identified barriers into four categories: organizational, inter-organizational, technological, and environmental barriers.

*Organizational barriers* deal with internal organizational challenges. Information-sharing sometimes requires changes within the organization, such as improving organization capabilities (related to employees' skills and IT capabilities) (Joseph, 2009; Yang & Maxwell, 2011; Yang & Wu, 2014) , as well as preparing financial resources or dedicated human resources for information-sharing (Ebrahim & Irani, 2005; Ismail & Yusof, 2010; Moon, 2002; Nooshinfard & Nemati-Anaraki, 2014; Yang & Maxwell, 2011), which can be hampered by rigid bureaucratic or hierarchy structure in the organization (Ahrend et al., 2014; Ismail & Yusof, 2010; Layne & Lee, 2001; Nooshinfard & Nemati-Anaraki, 2014), difficulties in convincing and getting support from top-level management (Fan et al., 2014; Gil-Garcia et al., 2007; Layne & Lee, 2001; Yang & Maxwell, 2011; Zheng et al., 2009), or issues in organizational culture (which is resistant to share, innovate, or change) (Ahrend et al., 2014; Ismail & Yusof, 2010; Moon, 2002; Nooshinfard & Nemati-Anaraki, 2014; Yang & Maxwell, 2011). This can be exacerbated by the unclear benefits received by the organization that joins in sharing information with other organizations (Pardo et al., 2006; Yang & Maxwell, 2011).

Some articles have also mentioned collaboration and relationship-related issues between organizations that potentially interfere the information-sharing. In this research, we group those issues into *inter-organizational barriers*. Issues that are often discussed in previous research that fall into this category include concerns about information misuse (Sayogo et al., 2017; Yang & Wu, 2014), which may lead to distrust among organizations (Donahue & Zeckhauser, 2006; Layne & Lee, 2001; Savoldelli et al., 2014; Wenjing, 2011; Yang & Maxwell, 2011; Zhang et al., 2005), communication problems (Crowther, 2014; Desourdis & Contestabile, 2011; Gilja, 2013), ambiguous roles and responsibilities (Crowther, 2014; Sayogo et al., 2016), lack of common goals (Gil-García et al., 2007; Gil-Garcia et al., 2009; Lam, 2005; Ronaghan, 2002; Savoldelli et al., 2014), power imbalance (Budd, 2015; Nicholls & Huybrechts, 2016), investment ambiguity (Fan et al., 2014; Layne & Lee, 2001; Moon, 2002; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011; Zheng et al., 2009), and project management issues (Gil-García et al., 2007; Karagoz et al., 2014; Zhang et al., 2005). In addition, some studies argued that lack of measurement and evaluation (Heeks, 2006; Moon, 2002; Savoldelli et al., 2014) and no sharing guidelines (Ronaghan, 2002; Samaddar et al., 2006) might also complicate the adoption of information-sharing by organizations. Last, the existence of information asymmetry can be a burden for information-sharing, making some organizations resistant to sharing their information (Aviram & Tor, 2003; Engel et al., 2014; Liu & Tan, 2008; Yang & Wu, 2014). Information asymmetry can also occur in terms of decision made related to information-sharing initiative, some organizations have better insights than others, which complicates the dynamic of inter-organizational relationship among participants (Aviram & Tor, 2003; Engel et al., 2014; Liu & Tan, 2008; Yang & Wu, 2014).

The next category is *technology-related issues* that can hinder information-sharing. As organizations that participate in information-sharing can have varied and heterogeneous information systems, system interoperability and compatibility come up as potential issues (Gil-García et al., 2007; Lam, 2005; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011). Moreover, data in each organization can be managed in varied ways, in different standards, and at the varied level of granularity (Dawes, 1996; Pardo et al., 2006; Sayogo & Gil-Garcia, 2014; Scholl et al., 2012; Yang & Maxwell, 2011; Zhang et al., 2005). Sharing data without pre-determined standards would make the requesting parties immersed in clerical work and have less time to analyze the content of the shared data (Perdana et al., 2014). Some studies also mentioned infrastructure issues related to the unavailability of sharing infrastructure or lack of bandwidth of network infrastructure (Gil-Garcia & Sayogo, 2016; Pardo et al., 2006; Ronaghan, 2002; Savoldelli et al., 2014; Zhang & Dawes, 2006). Lack of enterprise IT architecture was also stated by prior research (Ebrahim & Irani, 2005; Janssen & van Veenstra, 2005; Lam, 2005; Li & Lin, 2006; Veenstra et al., 2011), which related to the fragmentation of internal IT system of participants of information-sharing and makes it hard to provide quality data to be shared.

Last, prior research also mentioned *environmental issues*, especially political or market issues. Barriers that are included in this category are environmental and institutional complexity (Bharosa, Janssen, van Wijk, et al., 2013; Crowther, 2014), lack of political support and commitment (Akbulut et al., 2009), and regulation issues (this include restrictive laws for some domains) (Bharosa, Janssen, Klievink, et al., 2013).

**Table 3-4 Summary of B2G information-sharing barriers**

| Categories | Barriers | Source |
|---|---|---|
| Organizational | Resource problems | (Ebrahim & Irani, 2005; Ismail & Yusof, 2010; Moon, 2002; Nooshinfard & Nemati-Anaraki, 2014; Yang & Maxwell, 2011) |
| | Individual and organization resistance to change | (Ahrend et al., 2014; Ismail & Yusof, 2010; Moon, 2002; Nooshinfard & Nemati-Anaraki, 2014; Yang & Maxwell, 2011) |
| | Bureaucratic and hierarchical structures | (Ahrend et al., 2014; Ismail & Yusof, 2010; Layne & Lee, 2001; Nooshinfard & Nemati-Anaraki, 2014; Yang & Maxwell, 2011; Zheng et al., 2009) |
| | Lack of incentives and rewards (including unclear benefits) | (Pardo et al., 2006; Yang & Maxwell, 2011) |
| | Lack of organizational capability (esp. IT capability) | (Joseph, 2009; Yang & Maxwell, 2011; Yang & Wu, 2014) |
| | Lack of top-level management support | (Fan et al., 2014; Gil-Garcia et al., 2007; Layne & Lee, 2001; Yang & Maxwell, 2011; Zheng et al., 2009) |
| Inter-organizational | Lack of common goals | (Gil-García et al., 2007; Gil-Garcia et al., 2009; Lam, 2005; Ronaghan, 2002; Savoldelli et al., 2014) |
| | Ambiguity of funding (including cost consideration and limited investment) | (Fan et al., 2014; Layne & Lee, 2001; Moon, 2002; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011; Zheng et al., 2009) |
| | Project management problems | (Gil-García et al., 2007; Karagoz et al., 2014; Zhang et al., 2005) |
| | Imbalance of power | (Budd, 2015; Nicholls & Huybrechts, 2016) |
| | Communication problems | (Crowther, 2014; Desourdis & Contestabile, 2011; Gilja, 2013) |
| | Lack of trust, respect and confidentiality among organizations | (Donahue & Zeckhauser, 2006; Layne & Lee, 2001; Savoldelli et al., 2014; Wenjing, 2011; Yang & Maxwell, 2011; Zhang et al., 2005) |
| | Ambiguity of roles and responsibilities | (Crowther, 2014; Sayogo et al., 2016) |
| | Information asymmetric | (Aviram & Tor, 2003; Engel et al., 2014; Liu & Tan, 2008; Yang & Wu, 2014) |
| | Lack of measurement and evaluation | (Heeks, 2006; Moon, 2002; Savoldelli et al., 2014) |
| | Information misuse concerns | (Sayogo et al., 2017; Yang & Wu, 2014) |
| | No sharing guidelines | (Ronaghan, 2002; Samaddar et al., 2006) |
| Technological | Infrastructure issues | (Gil-Garcia & Sayogo, 2016; Pardo et al., 2006; Ronaghan, 2002; Savoldelli et al., 2014; Zhang & Dawes, 2006) |
| | Lack of system security | (Ebrahim & Irani, 2005; Medjahed et al., 2003; Savoldelli et al., 2014; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011) |
| | Lack of enterprise IT-architecture | (Ebrahim & Irani, 2005; Janssen & van Veenstra, 2005; Lam, 2005; Li & Lin, 2006; Veenstra et al., 2011) |

| | | |
|---|---|---|
| | Incompatible hardware and software | (Gil-García et al., 2007; Lam, 2005; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011) |
| | Data issues (lack of common data definitions and standards, inconsistent data structure, and low level of data quality) | (Dawes, 1996; Pardo et al., 2006; Sayogo & Gil-Garcia, 2014; Scholl et al., 2012; Yang & Maxwell, 2011; Zhang et al., 2005) |
| Environmental | Lack of political support and commitment (including political risks) | (Gil-García et al., 2007; Ronaghan, 2002; Savoldelli et al., 2014; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011; Zhang et al., 2005) |
| | Environmental and institutional complexity | (Bharosa, Janssen, Klievink, et al., 2013; Gil-García & Pardo, 2005) |
| | Regulation issues | (Gil-García et al., 2007; Gil-García & Pardo, 2005; Ronaghan, 2002; Savoldelli et al., 2014; Sayogo & Gil-Garcia, 2014; Zhang et al., 2005) |

While most of the barriers discussed are typical for inter-organizational information-sharing regardless of the context, sectors, or institutional arrangements, some of the barriers may only appear in information-sharing involving government agencies due to their bureaucratic, rigid, and hierarchical decision-making structures (Rabaiah & Vandijck, 2007). There are also issues related to lack of IT capability or lower IT maturity compared to private sectors, as well as organizational culture in which less flexible and slow to innovate (Dawes, 1996; Zhang et al., 2005).

In addition, Veenstra et al. (2011) argued that it is better to address all possible barriers because some of the barriers might be interrelated. Also, this ensures that dealing with barriers can be more comprehensive. Making a distinction between specific barriers for government and businesses is difficult because in a project involving interactions between many users, the problems of one side could result in challenges for the other side. Based on the list, we argue that understanding the structure of information-sharing arrangements can manage the potential barriers properly and thus lead to an increased motivation to share through the information-sharing system.

## 3.3 Factors influencing information-sharing from literature

Several studies have discussed the factors that influence information-sharing, especially from the perspective of the adoption of information-sharing or those that influence the behavior of users (both individuals and organizations) to share information with others. Most of these studies used technology adoption theory as their references: Technology Acceptance Model (and its derivatives), Technological-Organizational-Environmental model, Diffusion of Technology model, or DeLone and McLeane model. Factors are also presented in the context of a specific implementation domain (see Bharosa, Janssen, van Wijk, et al. (2013); Fleming et al. (2014); Melin and Axelsson (2010); Yaraghi et al. (2015)), in the form of cross-section research (see Gil-Garcia and Sayogo (2016); Sayogo and Gil-Garcia (2014)), as well as longitudinal research (see Karlsson et al. (2017)).

Information-sharing research involving government institutions cannot be separated from the research of Dawes (1996), which provides a conceptual basis and proposes a framework for the benefits of information-sharing and the factors that influence its adoption by government institutions.

Akbulut et al. (2009) and Yang and Maxwell (2011) extensively extended the list of factors influencing public information-sharing adoption by public organizations. For the business side, similar studies, for example, were submitted by Kim and Lee (2008); Lampathaki et al. (2009); Nurmilaakso and Kauremaa (2012); Rawashdeh and Al-namlah (2017).

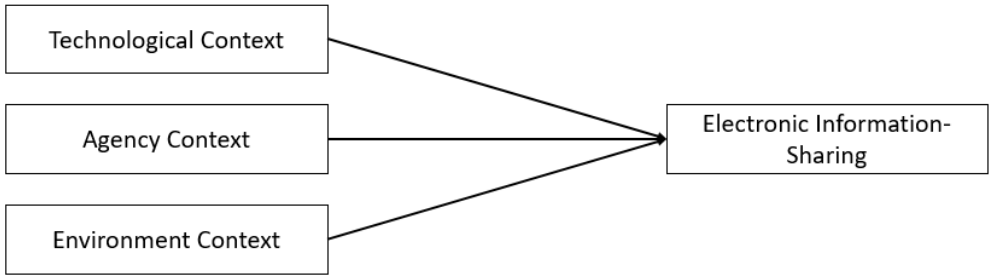


**Figure 3-4 General Framework of Factors Influencing information-sharing involving government (Akbulut et al., 2009)**

Moreover, both the models from Akbulut et al. (2009) (shown in Figure 3-4) and Yang and Maxwell (2011) (shown in Figure 3-5) use the TOE model as the basis, divided into the technological, organizational, and environmental context. Both models are used as a baseline for other research, especially in the realm of information-sharing involving government organizations.

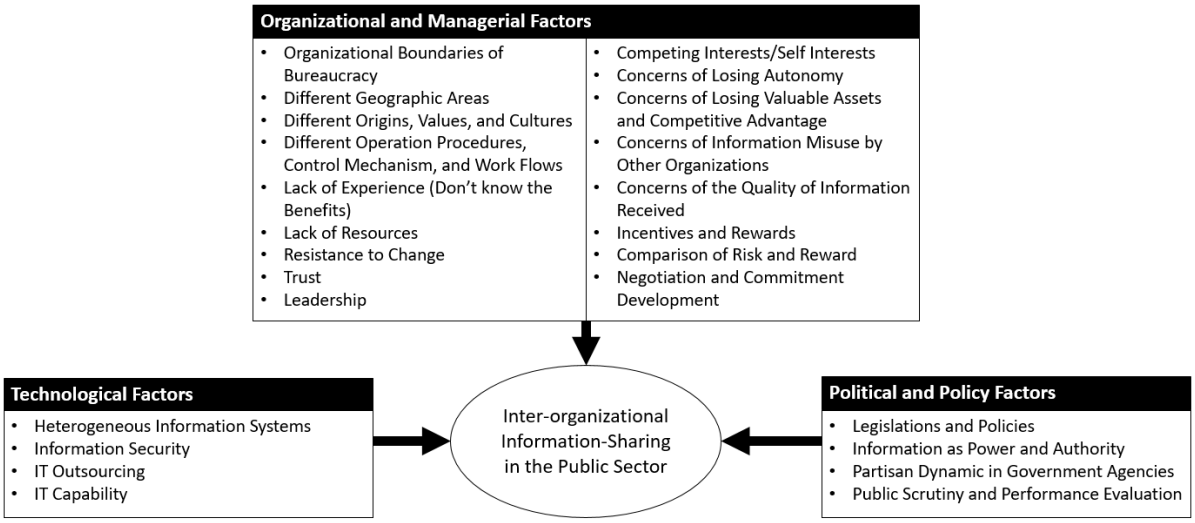


**Figure 3-5 Factors influencing inter-organizational information-sharing in the public sector (taken from Yang and Maxwell (2011, p. 169))**

We analyzed the factors provided by the aforementioned frameworks. We combined them with findings from other studies (see Romochkina et al. (2016), (Singerling et al., 2015), (van den Broek & van Veenstra, 2015), or Yang et al. (2014)) to find the relationship between the factors and the architecture and governance structures used in the B2G information-sharing system. The results are shown in Table 3-5 for organizational factors, Table 3-6 for technological factors, and Table 3-7 for inter-organizational factors. The organizational factors deal with the internal settings and capabilities of the firm, which can influence the information-sharing arrangements. The technological factors in this study refer to the requirements and capabilities of an innovation/technology that organizations

will adopt. Lastly, the inter-organizational factors are required to develop inter-organizational relationships.

**Table 3-5 Organizational factors of the information-sharing arrangement from literature (Praditya & Janssen, 2016, p. 156)**

| No | Determinants | Source | Description |
|---|---|---|---|
| 1 | Firm size | (Sambamurthy & Zmud, 1999; Singerling et al., 2015; Zhu et al., 2003) | Firm size may influence both user adoption and system arrangement. Smaller organizations usually choose a dyadic configuration mainly because they fear losing control and have limited resources. |
| 2 | Firm structure | (Sambamurthy & Zmud, 1999; Yang & Maxwell, 2011; Zheng et al., 2009) | Firm structure may influence information-sharing system governance. For example, firms with many branches may prefer a decentralized structure. |
| 3 | Management support | (Borgman et al., 2013) | IT adoption usually requires support from top-level management, e.g., the provision of resources or the ability to change the organizational structure. In terms of the arrangements, management support may influence the decision-making, in considering the advantages and disadvantages of certain arrangements. |
| 4 | Firm strategy | (Gil-García et al., 2007; Grover, 1993; Sambamurthy & Zmud, 1999) | Firm strategy may influence both user adoption and system arrangement. Building a system that aligns with a firm's strategy, either business or IT, will increase the eagerness of the firm to adopt the innovation. |
| 5 | Number of users | (Strong et al., 1997; Yang et al., 2014) | The number of users may determine which architecture and governance structure should be used for information-sharing |
| 6 | Availability of resources | (Sambamurthy & Zmud, 1999; Singerling et al., 2015; Yang & Maxwell, 2011) | Availability of resource may reflect in flexibility of organizations to implement a new technology, this can be decisive to determine which architecture to be used in information-sharing. |
| 7 | Power | (Hart & Saunders, 1997; Savoldelli et al., 2014; Yang & Maxwell, 2011) | Larger or more powerful organizations can push for specific solutions according to their interests. These organizations may also prefer to have centralized and top-down governance so they can have power to direct and dictate the outcomes. |
| 8 | Trust | (Hart & Saunders, 1997; Nicolaou et al., 2013) | Level of trust with other users influences how the organization deals with certain agreements in terms of, e.g., centralized vs. decentralized. |
| 9 | Level of adoption | (Barrett & Konsynski, 1982; Hameed et al., 2012; Saha, 2010) | Active users may contribute more in the governance and decision-making related to the system and may gain more benefits compared to passive users. |

| | | | |
|---|---|---|---|
| 10 | Firm governance | (Sambamurthy & Zmud, 1999) | Organizational governance mode influences the mode of IT governance in the organization. Thus, the mode of IT governance of organizations will influence the information-sharing arrangement. |
| 11 | Purpose of sharing | (Bharosa et al., 2015; van den Broek & van Veenstra, 2015) | The information-sharing arrangements can vary depending on the sharing purpose. For example, information-sharing arrangements for reporting purpose may different to transactional purpose because of difference in exchange frequency and type of data to be sent to users. This can affect system arrangement. |

**Table 3-6 Technological factors of the information-sharing arrangement from literature (Praditya & Janssen, 2016, p. 156)**

| No | Determinants | Source | Description |
|---|---|---|---|
| 1 | IT maturity | (Singerling et al., 2015; Zhu et al., 2004) (Gil-García et al., 2007) | Low-levels of IT maturity in an organization (e.g. poorly integrated internal systems) can make IT-facilitated information-sharing implementations more difficult to be implemented. |
| 2 | IT compatibility | (Borgman et al., 2013; Hung et al., 2015) | IT compatibility may influence the architecture of information-sharing system and user adoption. If new technology is compatible with the existing internal system, it is easier for organizations to adopt it. . |
| 3 | IT complexity | (Borgman et al., 2013) | Level of complexity is one aspect to be considered in developing information-sharing system, especially if many and diverse organizations using the same system. More complex system may require a complex governance structure to ensure all users understand their roles and to achieve the sharing objectives. |
| 4 | Number of interfaces | (Bharosa et al., 2015; Romochkina et al., 2016; Singerling et al., 2015) | Interface requirements can influence the information-sharing architecture. For example, to simplify setup then a dyadic topology is used. However, it requires more interfaces for more sharing partners and this can result in complexity in managing each interface. |
| 5 | Process compatibility | (Kamal et al., 2014; Singerling et al., 2015; Vernadat, 2010) | Information-sharing often require changes to an organization's business processes. This may hinder the adoption and influence the architecture of information-sharing system. |
| 6 | System security | (Savoldelli et al., 2014; Sayogo & Gil-Garcia, 2014; Yang & Maxwell, 2011) | System security is a critical factor in information-sharing. Exchanging information could violate user privacy and could make organizations resistant to adopt the system. |
| 7 | Interoperability standard | (Henning, 2013; Sayogo & Gil-Garcia, 2014) | Interoperability standard influences user adoption and system arrangement because this standard determines the internal adaptation and effort required of organizations. |

| | | | |
|---|---|---|---|
| 8 | Standardized data | (Guijarro, 2009; Scholl et al., 2012; Vernadat, 2010) | Standardized data influence user behavior and system arrangement. Users need to adopt standardized data in their system to make this shared data easier for the requesting party to interpret. Low maturity in IT system usually makes this adoption process more difficult. |
| 9 | Amount of data | (Bharosa et al., 2015; Sá et al., 2015; Tallon et al., 2013) | Bigger files need more storage, faster connections and better processors. It can also be assumed that bigger files contain more information and need to be processed in a more complicated way. |
| 10 | Number of transactions | (Bharosa et al., 2015; Singerling et al., 2015) | The amount of data that government agencies require to be reported is increasing in line with the number of new regulations. This factor is also why multilateral reporting systems are very helpful for organizations. |

**Table 3-7 Inter-organizational Factors of the information-sharing arrangements from literature (Praditya & Janssen, 2016, p. 156)**

| No | Determinants | Source | Description |
|---|---|---|---|
| 1 | Government regulation | (Kuan & Chau, 2001; Zhang et al., 2005; Zhu et al., 2004) | Policies such as mandating electronic disclosure can force organizations to implement certain systems, whereas policies such as privacy acts will be critical for the system arrangement, because they will make the data provider more cautious in the exchange process. In this case, network security will be the key factor. |
| 2 | Competition intensity | (Borgman et al., 2013; Kuan & Chau, 2001) | External pressure such as competition or public pressure forces organizations to innovate – not only in finding new revenue streams but also in making their business process more efficient. |
| 3 | Diversity of users | (Sayogo & Gil-Garcia, 2014) | The diversity of users involved in an information-sharing, with different goals or structures, leads to difficulties in finding a negotiated solution to the system arrangement. |
| 4 | Innovation initiator | (Klievink et al., 2016) | Information-sharing involving government authorities are usually initiated by those authorities, but it is also possible for businesses to trigger the innovation, because of their flexibility in investing in new technology. This factor can influence the governance of the system. |

## 3.4 Theory of Information-Sharing Arrangements

In this section, we discuss information-sharing arrangements which can help information-sharing actors overcome challenges and realize the benefits of information-sharing. We use theories that explain the nature of inter-organizational information-sharing, including institutional theory and technology (innovation) adoption, to conceptualize information-sharing. Specifically, we look at the system architecture and governance structure views used in B2G information-sharing. We also present key principles in setting-up inter-organizational information-sharing from literature and key variables that constructed the arrangements.

In various studies in management information systems research, especially in technology adoption and implementation, only a few have focused on the technology side as a single solution. Organizational problems, as listed in sub-section 3.2.5, are considered to be more critical, sometimes more challenging to solve and, therefore, without neglecting technology issues, are the main focus of resolution. In addition, studies related to the factors that influence technology adoption have also analyzed the relationship between the technology and the social context of the stakeholders or actors involved in the innovation towards the realization of benefits (see (Fountain, 2001; Luna-Reyes & Gil-Garcia, 2011; Orlikowski, 2008).

Furthermore, Gil-Garcia et al. (2009) proposed four components of cross-boundary information-sharing. According to this research, all of the components cover both social and technical aspects:

1) Trusted Social Network; dealing with the existing relationships between actors based on trust;
2) Shared Information; dealing with data and Information to be shared;
3) Integrated Data; refer to the requirement to implement data standard and integration for information-sharing;
4) Interoperable Technical Infrastructure; refer to the technical ability of two systems working together, reciprocally exchanging information, and using information that has been exchanged.

Moreover, Fedorowicz et al. (2014) provided design observations which consist of several parameters to be considered in arranging information-sharing: the organizational structure, governance of the system, regulation, investment, diversity of users, experience, IT maturity, standardization, system security, accessibility and data ownership, IT governance in internal organization, interoperability, power balance, and sharing frequency. Both studies imply that the concept of information-sharing is not just about the application of technology (ICT) represented by its architecture, but also governance aspects as information-sharing involves multiple and diverse actors, with a different understanding of values regarding information-sharing, be it the sharing activities itself or the implementation of a new system to support the activities.

In addition, the Infocomm Media Development Authority of Singapore (IMDA & PDPC, 2019) published a trusted data sharing framework that aims to help users to reap the benefits of data sharing and understand key considerations to enable data sharing. There are four considerations to enable data sharing, as shown in Figure 3-6.

The first consideration is *Data Sharing Strategy*. In this part, users should already define the purpose of data sharing activities, including the potential and value of data sharing and how it combines with internal data. In this part, participants should identify data sharing models that potentially can be used in their case, including if it is needed to engage with data service providers to help facilitate and support data sharing activities.

Second, consideration is related to *legal and regulatory* aspects. In this part, participants should determine whether the data can be shared, for example, by analyzing whether the data sharing could potentially harm data confidentiality or data privacy. In this part, participants should also identify if laws can influence how the data is shared, for example, related to the implementation of GDPR. In this part, it is recommended to create information-sharing arrangements among participants and data service provider(s) (if any).

Third, participants should consider the *technical and organizational aspects* of data sharing. In this part, the data-sharing mechanism needs to be defined, starting from data preparation, data transmission, and data acceptance and processing to produce results that impact public interests. In addition, details of the technical aspects of data sharing are also included, including data standards

and the software applications used to exchange the data, the implementation of the agreement ensuring the flow of information from data providers to data requesters goes well, authorized personnel who execute data sharing in each organization, as well as communication between participants.

The last consideration is the *operationalization of data sharing*. This part focuses on aspects when the data sharing between organizations is executed. This includes ensuring transparency and accountability of the data sharing processes, monitoring legal and regulatory compliances, potentially using the data for secondary purposes, and implementing data retention and disposal.

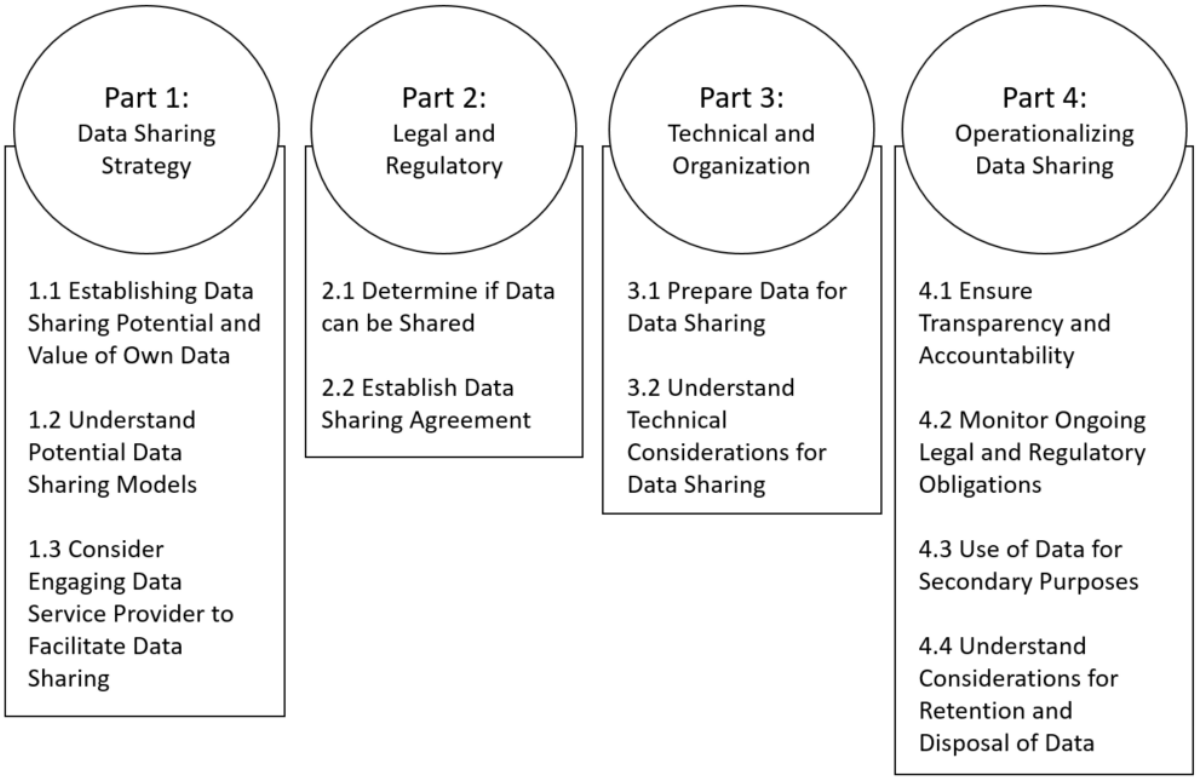


**Figure 3-6 Trusted Data Sharing Framework (adopted from IMDA and PDPC (2019, p. 12))**

Following that, we can identify certain principles that are typically used in implementing B2G information-sharing, as shown in Table 3-8, as follows:

**Table 3-8 Principles of B2G information-sharing**

| No | Principle | Description | References |
|---|---|---|---|
| 1. | The objective of information-sharing should demonstrate public interests or values | Proportionality use of data, means clear and demonstrable public interests must justify the purpose of data use (or re-use). Data use (or re-use) should be, therefore, limited by goal bindings, one or several purposes specified in the regulations or agreements enabling B2G information-sharing. | OECD |
| 2. | Regulations should protect sharing of critical or privacy-sensitive data | Various data can be shared in B2G for various purposes. Companies should be able to maintain competitive advantage or continue being able to | OECD, IMDA |

| | | | |
|---|---|---|---|
| | | monetize the insights derived from the data in question with respect to other interested parties. In addition, data privacy should also be protected and guaranteed not to be used improperly. In this case, information-sharing must be included in government regulation. Meanwhile, for other types of data, it is possible to do it voluntarily. | |
| 3. | Agreement among participants is necessary | This principle is to establish a trusted social network supporting information-sharing. The agreement should cover how to deal with safeguarding the data, technical and practical modalities for information-sharing, conditions for implementation, guiding principles for implementation and evaluation of information-sharing, applicable laws and dispute settlement mechanisms, and rules on liability for activities that may cause problems. | IMDA, OECD |
| 4. | Mutually beneficial | All involved parties should receive benefits from the information-sharing, while acknowledging the public interest goals, considering their roles in the information-sharing. | OECD |
| 5. | The required data and the level of quality should be pre-defined | Quality assurance should be addressed together. Companies should make an effort to assess the quality of the required data and governments should ensure that the data (received from many and different sources) processing is done in an appropriate approach to avoid the possibility of "selection bias" | OECD, IMDA |
| 6. | Apply standardization | The use of standards in information-sharing comprises data - metadata, application, platform, and process, including the use of an algorithm for calculation, data processing, and automated reasoning, aims to tackle the technical compatibility and interoperability issues. | OECD, IMDA |
| 7. | Ensure data confidentiality | The data collected and exchanged is only for agreed-upon purposes and cannot be used for things that may pose a risk to any of the participants of information-sharing. | OECD, IMDA |
| 8. | Qualified information-sharing system | The information-sharing system used should meet several conditions based on the principles of effectiveness, implementation, and compliance. This way, the expected benefits from information-sharing can be realized and the risks that may arise can be mitigated. | OECD, IMDA |

These principles further highlighted the importance of understanding information-sharing systems' architecture and governance structure. Therefore, the scope of information-sharing arrangements includes those two elements.

### 3.4.1 The architecture of Information-sharing system

In this section, we address the architecture of information-sharing systems. Several types of research have investigated the information systems' architecture used to share information crossing organizational boundaries. Inter-organizational systems (IOSs) are computerized information systems that cross the organization's limits and are responsible for the exchange of information supporting automated relations between business processes of different organizations (Robey et al., 2008). The definition is based on the conceptualization of IOS by Barrett and Konsynski (1982).

Discussion about digital information-sharing through IOS flourished with the introduction of Electronic Data Interchange (EDI). EDI is "the movement of business data electronically between or within firms (including their agents or intermediaries) in a structured, computer-process able data format that permits data to be transferred without re-keying, from a computer-supported business application in one location to a computer-supported business application in another location" (Hill & Ferguson, p. 3). This definition emphasizes that data can be exchanged electronically, even without human intervention, and streamlines the significance of structured data. EDI can be implemented using either electronic storage, electronic interface, or electronic gateway, depending on the information-sharing initiatives' requirements and objectives (Nakayama, 2003). The data should be stored in a shared database, exchanged via an interface protocol, or shared through a single window to many destinations (Reekers & Smithson, 1995). Then, electronic information-sharing is even more facilitated by utilizing communication protocols from the internet.

In accordance with the implementation of EDI, Roser et al. (2011) identified three architectural patterns: broker-less architecture, central broker architecture, and decentralized broker architecture. A broker-less architecture can be used to realize peer-to-peer communication. In this architecture, transaction of messages directly between elementary service (ES) of two organizations' systems. In the central broker architecture, a central broker component (using a controller service) orchestrates the exchange of messages between ESs of participants. Using this architecture, only the central broker has to be modified in case of a change occurrence. Last, decentralized broker architecture is a hybrid of the other architecture. It combines peer-to-peer elements with the hierarchical structure of the central broker architecture. Each organization has its own controller service (called view process) in this architecture, which orchestrates ESs in its system. The exchange is done through the VP, which encapsulates the ESs.

Following up on prior research, in this research, we analyze information-sharing system architecture using three design variables: network topology, level of integration, and data management approach. These three variables are addressed in the next subsection.

#### 3.4.1.1 Network typology

The first criterion in analyzing the architecture of information-sharing systems is from its network typology. Information can be shared across the boundaries of the government agencies through centralized, semi-centralized, or decentralized network typology (Yang et al., 2014). The first type of network typology is decentralized, in which most of the information is shared through paper-based, electronic media storage, and electronic interface. Using this type of information-sharing, the requesting party and the reporting party may need to set up different windows to enable the sharing of information, and of course, it affects the cost of development and maintenance, which can be high

in the long term (Yang et al., 2014). The second type of network typology is the *semi-decentralized type* which is done through an electronic gateway. An electronic gateway is designed to realize a real-time information search and verification. Therefore, the timeliness and currency of the shared information can be improved. The idea of an electronic gateway is that each reporting party can provide a gateway, and the requesting agency needs to implement it in their system. Thus, the reporting parties can maintain a single window to share information, and therefore they can have a control mechanism over which information needs to be shared to others. Despite its promising value, the electronic gateway could also become costly and complicated when more requesting agencies want to set up the connection to their back-end system.

The third type is the *centralized type*, which is done through the service platform. The service platform used to share information involving government usually developed by government (as the requesting parties), therefore it is referred as the Government Service Platform (GSP). GSP is designed to enclose the complexity of technology and maintenance by developing a single platform as an intermediary system to enable inter-organizational information-sharing (Yang et al., 2014). The idea behind the GSP is that it employs the star-shaped network so that any organization that want to exchange information can connect to the GSP through the interface from their legacy system, and thus, they can perform the information-sharing with any organization which also connect to the same GSP. The benefits of this kind of infrastructure would be the reduced cost and effort for each organization involved since the maintenance would be handled by one responsible government agency (Yang et al., 2014). Nevertheless, one of the drawbacks perhaps occurs when more agencies participate in the GSP. Since the main responsibility of the intermediary system is to maintain the complex information flows and business logic while also connecting legacy interfaces, the stability and efficiency of the GSP could reduce with an increasing load (Yang et al., 2014).

In addition, there are three forms of IOSs. The two on the extreme poles are the previously established form described by Choudhury (1997), namely the dyadic IOS and the multilateral IOS. The intermediary between the two forms is called the hybrid forms of IOS. In the *dyadic* IOS, an organization builds a direct electronic link with the sharing partner. On the other side, in the *multilateral* IOSs there could be a single system that is used to communicate with all the partners, so each organization do not need to build a direct connection to each partner. Later, de Corbière and Rowe (2010) proposed a new configuration for the Inter-organizational information systems (IOSs) to complement the previously established IOS forms from a structural linkage perspective. The structural linkage refers to the interconnection between the sending partner and the receiving partners in the context of inter-organizational information-sharing. The *hybrid form* of the IOS can interconnect partners with different preferences on the structural linkages, meaning that there is an organization (or group of organizations) implements both the dyadic linkage and multilateral linkage to share information with the sharing partners (de Corbière & Rowe, 2010).

#### 3.4.1.2 Level of integration

The second criterion for information-sharing system architecture is the level of integration. Information system integration can be defined as a process that physically or functionally links disparate computing systems and software applications to act as a coordinated unit (Hasselbring, 2000). From a technical perspective, information-sharing among any connected applications and data sources can be considered as an application of the *enterprise application integration* (EAI). Linthicum

(2000) proposes four types of EAI: data level, application interface level, method level, and user interface level. Data-level EAI is the data transaction between databases without changing the application. Application interface-level EAI is the use of application software interface to link business processes and information-sharing. Method-level EAI is the sharing of organization's business logic. Lastly, user interface-level EAI is the approach in combining applications by using its interfaces as common Integration points while data-level or application interface level access is not available.

Furthermore, as B2G, information-sharing can also be considered within the field of E-Government (or Digital Government). E-government maturity models can also provide insights into understanding information-sharing arrangements. Layne and Lee (2001) developed a four-stage E-Government maturity model: the first stage, "catalog," refers to the presence of a government organization on the Internet, aims to provide public information; the second stage, "transaction", refers to the availability of additional functions on the web-application of a government organization so that citizens can conduct online transactions with the organization, for example for applying for a driving license or passport; the third stage, "vertical integration" refers to the integration of a functional area across either one hierarchical government organization or different administrative levels; and the fourth stage, "horizontal integration" refers to the integration of processes and activities within and across different government organizations. The model provides insight that information-sharing is the key characteristic to achieving levels 3$^{rd}$ and 4$^{th}$. Layne and Lee (2001) suggested that implementing horizontal integration is considered more difficult than vertical integration, especially due to cross-domain organizational involvement.

Similarly, Klievink and Janssen (2009) provides five stages needed for public organizations towards implementing E-Government: 1) Stovepipes: reflects that few applications and public services or products are interconnected but data are not shared between government organizations; 2) Integrated government organizations: reflect the level that some of public service delivery and digital technologies within government organizations are integrated to create a one-stop window; 3) Nationwide portal: in this level, a nation-wide government platform is introduced to provide access to many government products and services; 4) Inter-organizational integration: this level is characterized by interoperability and standardization of cross-agencies are already established, so the public services from many government agencies are bundled and integrated, and can be delivered as virtually one service via a platform; and 5) Demand-driven or joined-up government: in this level, the government platform can provides relevant public services and make recommendations to the citizens. This stage can only be carried out after all the previous stages have been carried out smoothly, coupled with the use of new technologies that support the platform's capabilities to understand citizens' needs.

#### 3.4.1.3 Data management

The third criterion for information-sharing system architecture is a data management approach. Data management includes all processes for collecting, processing, storing and distributing the data (Krishnan, 2013). According to Pramatari et al. (2009) efficient data management is critical to ensure information quality and build user trust toward any decision from the information system.

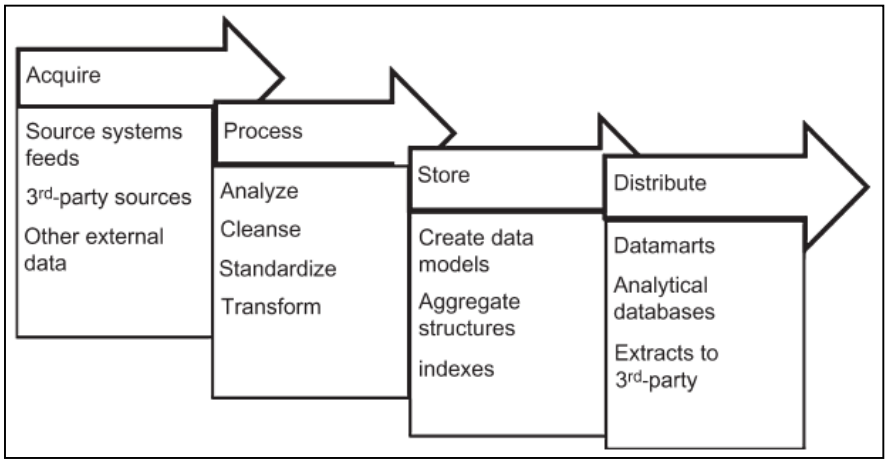


**Figure 3-7 Data management processes taken from (Krishnan, 2013, p. 220)**

Figure 3-7 shows the typical data management processes (Krishnan, 2013). In the acquire stage, data is collected from multiple sources. This acquisition process can be obtained directly from a database, sent as files, or available in a web service. In the process stage, the transformation and standardization data are completed, and data are analyzed and/or stored. Metadata and master data are very critical during this stage. In the storage stage, data is transformed into structured data. In the last stage named distribution, data is extracted from the process to be used in downstream systems.

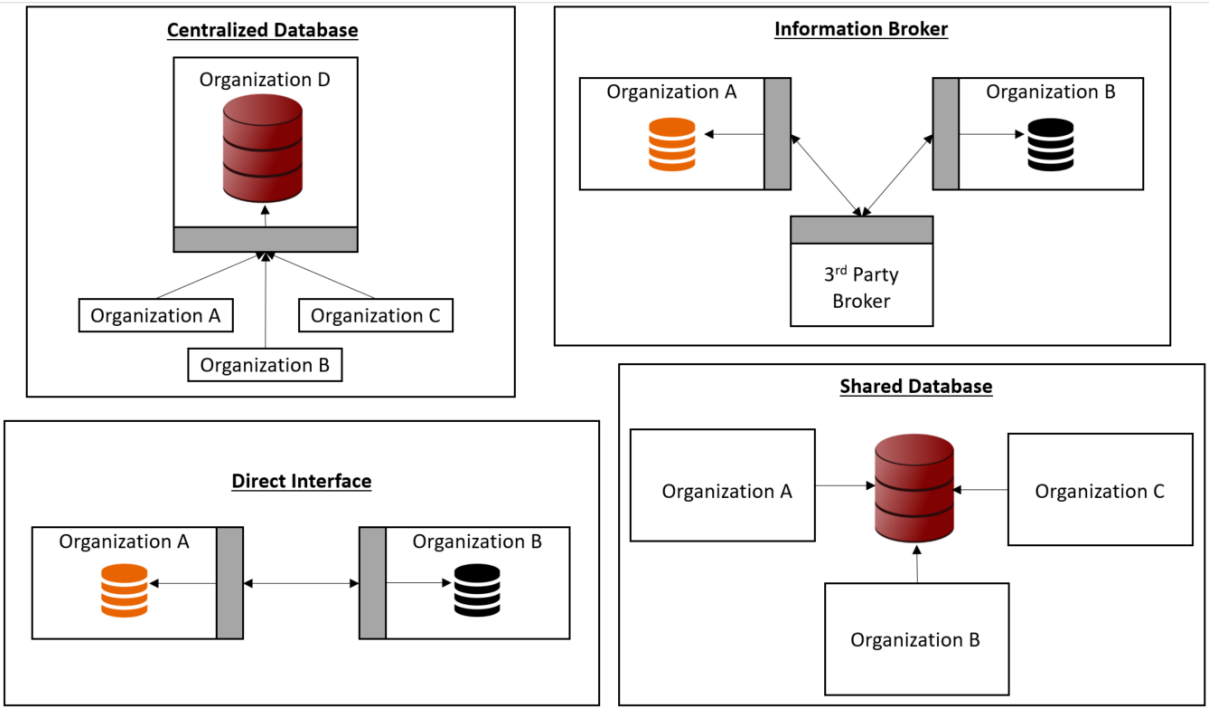


**Figure 3-8 Four types of data management models for information-sharing, visualized from Bekkers (2007)**

According to Bekkers (2007), who extend the prior work from Thompson (1967), back-office data management for information-sharing can be categorized into four types. The first type is the centralized database. In this type, a shared set of databases is developed in a coordinated manner, so that participating organizations can put relevant data into that database. The second type utilizes the

interface to facilitate information-sharing between organizations. Each organization should develop an interface to share the information in this case. The third type is the information broker type which uses an intermediary information service that facilitates the information-sharing based on the requesting or the reporting organizations' requirements. Lastly, a shared database type which allow the relevant data is collected and stored in that database and that the data can be used and re-used by other organizations.

### 3.4.2 Governance structure

The system's governance is considered to be an inherent part of information-sharing arrangements in this research. Governance is needed in realizing a system involving many actors to provide the structure for determining objectives and monitoring performance to ensure the objectives are achieved (OECD, 1999). Governance provides the structure for determining objectives and monitoring performance to ensure the objectives are achieved (De Haes et al., 2020). Governance structures are "designed to coordinate specific transactions among multiple actors concerning labor, capital, intermediate goods, information and the like" (Koppenjan & Groenewegen, 2005, p. 246).

Governance deals with authority, decision-making procedures, roles and responsibilities of involved actors, stakeholders' engagement, and control of the system (Fedorowicz et al., 2015; Sambamurthy & Zmud, 1999; Weill & Ross, 2005). Following these studies, in this research, we approach the governance structure of B2G information-sharing with 3 criteria: information-sharing enabler, decision-making structure, and type of stakeholder (including engagement between stakeholders and roles and responsibilities of the stakeholders); as described in the next sub-section.

#### 3.4.2.1 Information-sharing enabler

The first criterion for the governance structure is how information-sharing is enabled. In this research, information-sharing enabler deals with whether regulation is used as the basis of the sharing activities or done voluntarily. Businesses are often obliged to provide information to government agencies. Governments can use this information for several purposes, such as to evaluate and develop policies or to check the compliance of businesses with related laws and regulations (Bharosa, Janssen, van Wijk, et al., 2013). Legal aspects through regulations might be necessary to avoid improper use or data leakage into unauthorized hands (and can threaten the company's competitive advantage in the market). However, being mandated may force the information-sharing system adoption for private organizations sometimes regardless of whether the reporting party is ready or not, organizationally or technologically. In addition, certain laws, such as the European privacy act or Indonesian government regulation on the implementation of electronic system transactions, may also need to be complied with when implementing information-sharing. The European privacy act's objectives are to give citizens back control of personal data and simplify the regulatory environment for private sectors (European-Commission, 2018). These kinds of regulations can be critical for information-sharing arrangements since they require the protection of personal data, so the system should be provided with the proper security at the technical level.

Strict regulation in industry domains such as healthcare, food processing, or tax audits can also affect information-sharing arrangements (Bharosa, Janssen, Klievink, et al., 2013). For example, the Indonesian Government Regulation concerning the implementation of the "Electronic Transaction

Systems" requires supervision from the Financial Services Authority in every financial transaction carried out by public organizations. According to this regulation, the information-sharing arrangements should link to Financial Service Authority, and subsequent processing of each transaction will depend on the assessment and approval of this agency.

Inter-organizational information-sharing may require an agreement between participants. The establishment of an agreement among participants is considered one of the key principles of B2G information-sharing, according to the document entitled: 'Guidance on sharing private sector data in the European data economy' (European-Commission, 2018). An information-sharing agreement is useful to ensure the commitment to reduce asymmetric information among participants by providing access to information. The agreement should address the objective of information-sharing, the sharing mechanism (including what information to exchange, how it will be exchanged, and when the exchange will take place), the scope of data usage, and the responsibility of each organization involved in information-sharing (European-Commission, 2018; OECD, 2018).

Information-sharing can be based on an agreement between two organizations having an interest in conducting information-sharing on a bilateral basis. In addition, if information-sharing involves many parties, a multilateral agreement can also be made. This means that all participants must implement the clauses in the agreement. In some cases, these two types of agreements can take place simultaneously. For example, in the implementation of a One Map system. Information-sharing is enabled through a multilateral agreement between all involved parties. However, it does not rule out the possibility of a bilateral agreement in terms of supporting the fulfilment of certain data carried out by two organizations.

In addition, there are other types of agreements for information-sharing: relational and transactional (Cheng, 2011; Liu et al., 2017). The relational agreement focuses on developing trust, interdependence, and mutual benefits between parties and less on legal contracts or institutional-level regulations (Provan & Gassenheimer, 1994). This type of agreement is about building a long-term relationship and allowing involved parties to position themselves to achieve a common goal (Park, 1996). In contrast, transactional agreements can be considered more formal contracts, built for the short-term, focusing on fulfilling obligations (Liu et al., 2017) to share data. This type of agreement can be a derivative of institutional-level laws or regulations. As a result, involved parties have a stronger basis for deciding any disputes that may occur during information exchange (Li et al., 2006; Liu et al., 2017).

#### 3.4.2.2 Type of stakeholders

The second criterion is the type of stakeholders. Stakeholders of information-sharing can be primary or secondary stakeholders (Fedorowicz et al., 2010; Klievink et al., 2012b). The primary stakeholders are groups that directly influence or are affected by what happens in the information-sharing by its results, impacts, activities, or decisions. The primary stakeholders in information-sharing are also highly interdependent on each other (Klievink et al., 2012b). On the other hand, secondary stakeholders do not directly interact or are not directly affected by information-sharing but can influence the behaviors or decisions of other stakeholders in information-sharing (Klievink et al., 2012b). According to Mitchell et al. (1997) there are three parameters to identify stakeholders: power, legitimacy, and urgency. Power deals with the parties who pose power to achieve the desired outcomes. Legitimacy refers to "generalized perceptions or assumptions that the actions of an entity

are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions“ (Suchman, 1995, p. 574). While urgency deals with parties who demand to call for urgent action that must be taken immediately.

In addition, Fedorowicz et al. (2010) classify the types of stakeholders involved in an inter-organizational information-sharing environment into four groups. First, the data controller; refers to the person or entity with the authority to determine the purpose and usage of the collected data. Second, the data subject; refers to the individual or entity for which data is collected for specific purposes. Third, the data provider; refers to the person or entity that provides the data but does not necessarily own and use the data. Lastly, secondary stakeholder; refer to the person or entity that could have an influence on the data providers but not necessarily interact with the system. Usually, the secondary stakeholders consist of the legislator, associations, or public interest organizations (Fedorowicz et al., 2010).

#### 3.4.2.3 Decision-making structure

The third criterion is the decision-making structure. According to the US *National Institute of Standards and Technology* (NIST), there are three governance models which can be used in an IT-related initiative based on a decision-making structure: 1) a centralized approach; 2) a decentralized approach; and 3) a *hybrid* approach. Similarly, previous studies have revealed a widely known dichotomy governance structure, such as the hierarchical and network structures (Demil & Lecocq, 2006; Lowndes & Skelcher, 1998).

*Centralized* or *Hierarchical* decision-making structure requires (formal) authority and involves a chain of command from the power holder to other parties. A hierarchical decision-making structure is suitable when the decision is needed quicker or has a time limit (e.g., in an emergency), demands better accountability of who decides what and when, or when most participants refuse or are unavailable to participate (Dressler, 2006).

On the other hand, the *decentralized structure* is a decision-making process in which all participants negotiate decisions in the best interest based on their own situations and by looking at others (Bressen, 2012) to achieve collective agreements or *consensus*. Consensus-based decision-making requires participants to feel committed to a common goal, input from each participant, trust among participants, and good faith in solving all problems (Dressler, 2006). Consensus is beneficial in empowering or encouraging participation and distributing power among all involved parties. However, achieving consensus is considered more challenging in larger groups or when decisions need to be made quickly (Dressler, 2006).

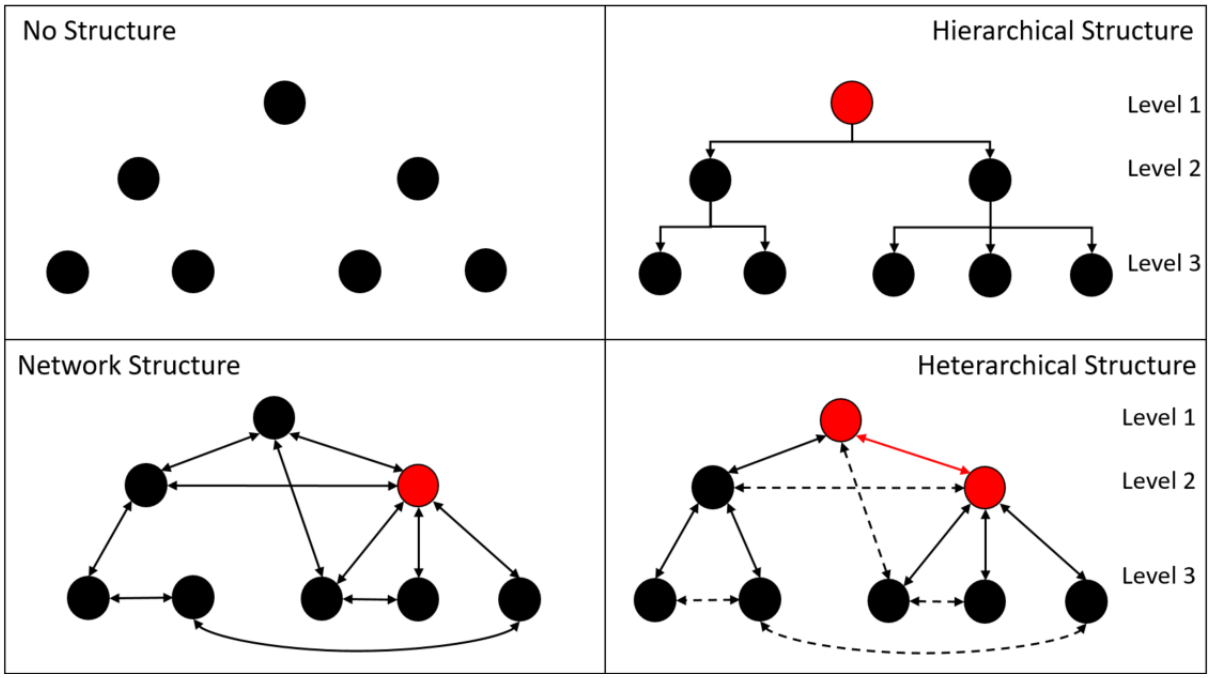


**Figure 3-9 Typology of decision-making structures implemented in information-sharing (adopted from (Cumming, 2016, p. 630))**

In addition, Cumming (2016) complemented the hierarchical and network approach with the heterarchical structure, as illustrated in Figure 3-9. A *heterarchical* structure bridges the ideas of hierarchical institutional and organizational power theories with the interaction and connectivity of the actors in the network and thus provides a conceptual tool for the analysts to have a richer and contextualized perspective regarding governance structure (Cumming, 2016).

## 3.5 Conclusions

This chapter reviewed the literature about information-sharing arrangements. The review shows that there are several benefits that organizations can expect by adopting or implementing information-sharing. Some studies also identified that these benefits are likely to disproportionately distribute among organizations, including the reporting party or the requesting party, the government or businesses. The number of challenges faced in implementing information-sharing is even more wide-ranging based on the analysis in previous studies. Many factors are considered to influence information-sharing, in addition to organizational adoption of information-sharing systems. These factors serve as references in analyzing the factors that influence the arrangement of information-sharing, especially in the business-to-government context.

Last, in this chapter, information-sharing arrangements have also been briefly elaborated on, including the elements that are the focus of this research: system architecture and governance structure of information-sharing systems, as well as the variables that form the basis of the analysis in this study.

**Table 3-9 Framework for characterizing information-sharing arrangements**

| Aspect | Model | Source | Options |
|---|---|---|---|
| System Architecture | Network typology | (Yang et al., 2014) | media storage, interface, gateway, or service platform |
| | | (Choudhury, 1997; de Corbière & Rowe, 2010) | electronic dyads, hybrid, or multilateral |
| | Data management approach | (Bekkers, 2007) | a centralized database, electronic interface, information broker, or shared database |
| | Level of integration | (Layne & Lee, 2001) | catalog, transaction, vertical integration, or horizontal integration |
| | | (Klievink & Janssen, 2009) | stovepipes, integrated governments, nationwide-portal, inter-organizational integration, or demand-driven |
| System Governance | Type of stakeholders | (Fedorowicz et al., 2010; Klievink et al., 2012b) | data controller, data subject, data provider, or secondary stakeholders |
| | Decision-making structure | (Cumming, 2016; van den Broek & van Veenstra, 2015) | hierarchical, network, or heterarchical (hybrid) |
| | Information-sharing enablers | (Peng, 2015) | mandatory or voluntary |

From all of the aspects and constructs of a system architecture and a governance structure of information-sharing arrangements, we developed a framework to characterize information-sharing arrangements presented in Table 3-9. This framework is helpful during case study analysis to understand the type of arrangements used for each case investigated, as described in the following chapter.

# 4. Understanding B2G information-sharing arrangements in practice

As presented in Chapter 3, prior studies list a wide range of factors that potentially influence B2G information-sharing arrangements. Since the factors were collected from many studies and models from various cases or domains, some factors might be relevant while others might be less relevant to the context of this research. Although it is appealing to cover all possible factors and have a complete view, this research focuses on the relevant or most influential factors to develop a parsimonious model. We argue that seeking a complete view would be difficult since the context also plays an important role. In this case, relevant factors in arranging B2G information-sharing in the financial reporting system may differ from other domains, such as health information exchange or port-logistics information systems. Furthermore, some factors have limited influence and might only distract from the factors that really matter.

As presented in Figure 4-1, this chapter discusses the qualitative part of this study to investigate the implementation of B2G information-sharing to gain a deep understanding of B2G information-sharing arrangements and the factors influencing these arrangements. The case study method was used as the main research approach to reach the objective. The multiple cases presented in this chapter aim to answer two research questions: 'which factors influence B2G information-sharing arrangements?' and 'which factors (or combination of factors) influence elements of information-sharing arrangements? '

This chapter starts with an overview of the case study approach. We selected cases in the implementation of information-sharing systems between public and private organizations in the financial reporting area. Two cases were investigated in the implementation of XBRL as data standard in financial reporting and two cases in the implementation of Automatic Exchange of Information (AEOI). We used the following set of criteria in selecting the case studies: 1) The case should represent the implementation of B2G information-sharing, including bringing various stakeholders; 2) The case should vary in their stage of implementation; 3) The case should have historical data, at least one year, to allow us in capturing the dynamic of the system implementation; and 4) The case should be accessible, in term of the availability of data and potential respondents. Next, we discuss the first case: the implementation of an XBRL-based reporting system. We begin with an introduction to XBRL, followed by a description of the XBRL-based reporting systems in the Netherlands and Indonesia. Then, we discuss the second case: the implementation of AEOI. We begin with an introduction of AEOI followed by describing the information-sharing system to enable AEOI in the Netherlands and Indonesia.

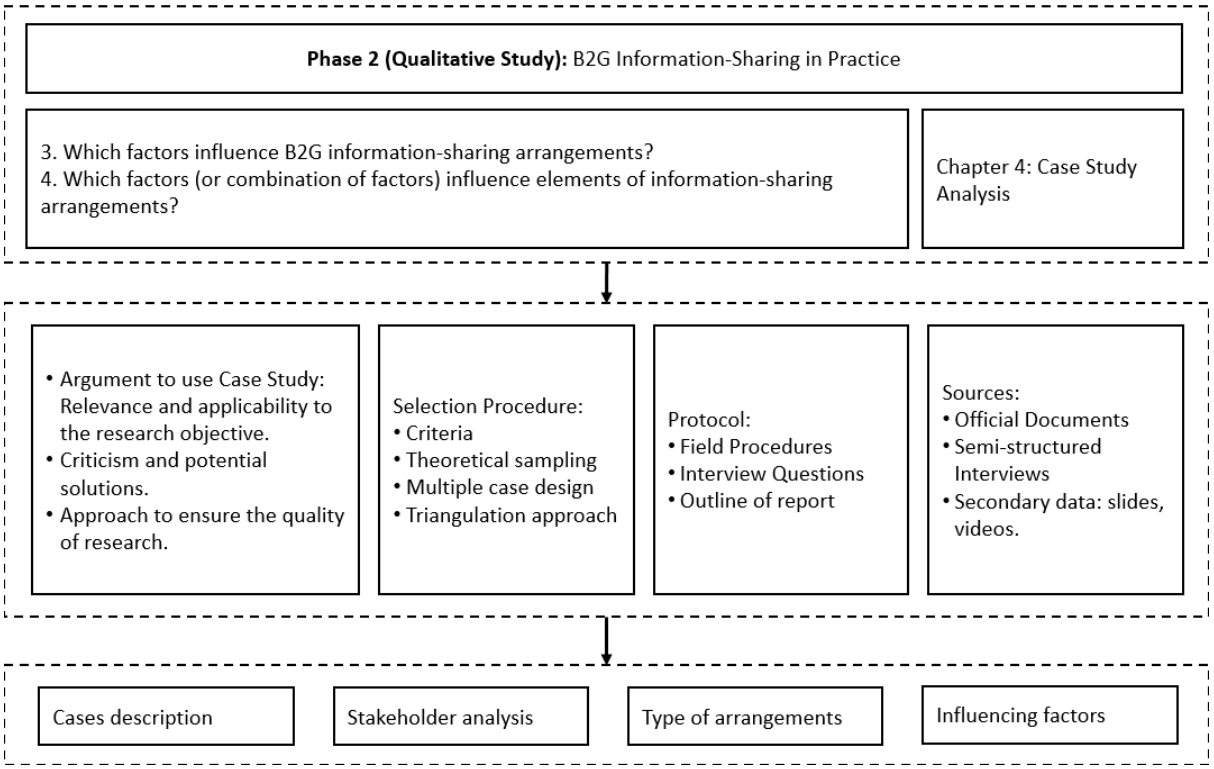


**Figure 4-1 Qualitative Study Framework used in this research**

For all cases, we divided the discussion into four parts. First, we start by describing the development of information-sharing arrangements. This part shows the key milestones in each case in a timeline. We adopted the framework from Janssen and Tan (2014), who divided the implementation of information-sharing into 3 phases: 1) exploration, the period of examining the opportunities and limitations of the information-sharing system; 2) implementation, the period of the development of information-sharing system and setting-up sharing processes; and 3) exploitation, the period when the information-sharing system has been adopted by the organization in carrying out its daily activities, while continuously making improvements and assessments for further expansion.

Second, as B2G information-sharing involves a wide range of participants from various organizations, the key actors, their perspectives, motivations, roles, and responsibilities in information-sharing were analyzed using stakeholder analysis. The stakeholders' positions, interactions, and relationships can be reflected in the implementation and adoption strategies (Klievink et al., 2012b).

Next, focusing on the objectives of this study, the case study provides information about the types of arrangements used to facilitate information-sharing. Last, we discuss factors influencing information-sharing arrangements derived from all cases. The analytical lens used for the case study is presented in Figure 4-2. The findings of this phase are used to develop a conceptual model with some hypotheses to be tested in the next phase.

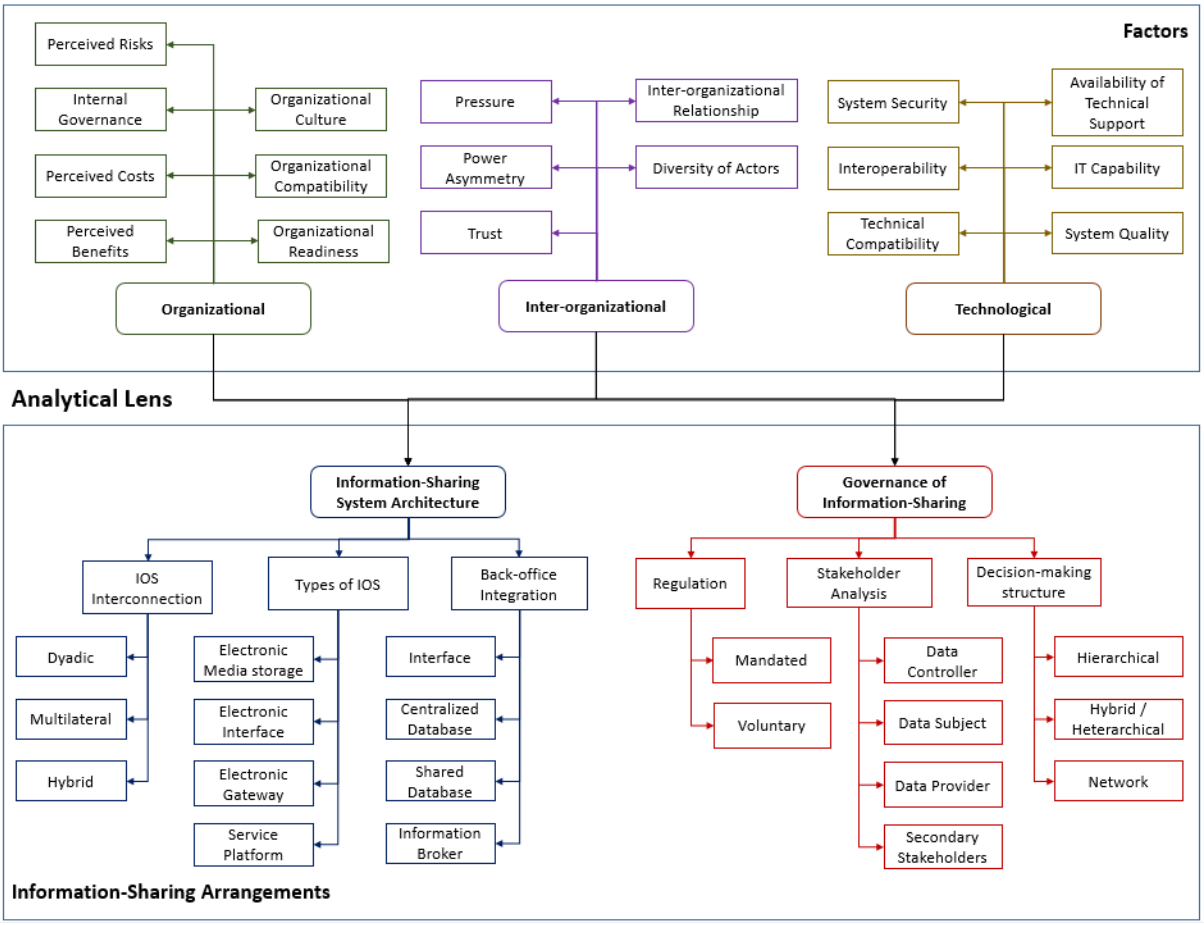


**Figure 4-2 Analytical Lens of Case Study**

# 4.1 Data Collection

As discussed in Chapter 2, primary data were collected from respondents through semi-structured interviews and group discussions. Data were combined with secondary data collected mainly from presentations (slides and videos) and official documents. In this study, only people involved in program development were selected as respondents, as presented in Table 4-1. Most respondents have been working since the program started from each information-sharing case.

**Table 4-1 Respondents of Case Study**

| Case | Position | Organization | Years of Experience |
|---|---|---|---|
| SBR - NL | Project Manager | Tax Office | > 10 with XBRL and SBR |
| | Auditor | Tax Office | > 10 with SBR |
| | SBR International Advisor | Logius | > 10 with XBRL and SBR |
| | Consultant | Thauris | > 5 years with SBR |
| | System Architect | EBPI | > 5 years with SBR |
| XBRL - INA | Project Manager | Central Bank | > 5 years with XBRL |
| | IT Manager | Central Bank | > 5 years with XBRL |
| | Business Unit Manager | Central Bank | > 5 years with XBRL |
| | IT Manager | Private Bank | > 5 years with XBRL |
| AEOI - NL | IT Architect | Tax Office | > 5 years with AEOI |

| | | | |
|---|---|---|---|
| | Program Manager | Tax Office | > 5 years with AEOI |
| AEOI - INA | Business Manager | Tax Office | > 5 years with AEOI |
| | Project Manager | INA - FSA | > 5 years with AEOI |
| | System Analyst | INA - FSA | > 5 years with AEOI |
| | Data Analyst | INA - FSA | > 5 years with AEOI |
| | System Developer | INA - FSA | > 5 years with AEOI |

Interviews were conducted in several timeframes. For the first case study, interviews were conducted 14 times in March - June 2016, then 3 times in October - November 2018. The additional 3 interviews were conducted to add some information that had not been obtained in the previous interviews. For the second case study, 7 interviews were conducted in the period from July to October 2018. As explained in chapter 2, during the case study, there were 2 additional researchers who conducted their masters' thesis in a related field using the same case studies. The case study data was collected together. The case study descriptions are different for each researcher because the research objectives were different. This research elaborates on the results of the case study in more detail and focuses more on information-sharing arrangements and the factors that influence them in each case.

## 4.2 Case study 1: Implementation of XBRL-based Reporting System

### 4.2.1 Introduction of eXtensible Business Reporting Language (XBRL)

XBRL or eXtensible Business Reporting Language is a software language developed as a new and standardized approach to simplify the way organizations prepare, validate, consume and analyze financial data (Kernan, 2008). XBRL is built on top of XML. XBRL emerged because prior financial reporting procedures were identified as one of the main problems for the management and audit process of financial data (Chang & Jarvenpaa, 2005). XBRL facilitates a more efficient reporting process by enabling people to publish reports accurately, test reports against a set of rules and business logic, use reports with predefined advanced definitions, and process reports in a variety of alternative languages and formats (Debreceny et al., 2009).

Prior studies on digital and web-based business reports found that there were three fundamental data issues to be addressed for financial reporting: the data source, data attributes, and data standardization (Debreceny & Gray, 2001). XML solves the first two problems using tagging text but fails to address the report consistency problem since all of the parties could expand and create their own customized tags (Debreceny & Gray, 2001). The third problem is addressed by XBRL which provides the data framework standard to reduce the variation in schematic and semantic data to improve data interoperability originating from various sources (Zhu & Wu, 2011). There are also issues regarding the reporting mechanism, such as a human error in data input and manual extraction, data redundancy, time constraint, software compatibility, and data interpretation (Eierle et al., 2014). A fully digitalized system-to-system (S2S) information-sharing mechanism can be used to address those issues, and adopting XBRL can help organizations implement S2S information-sharing.

XBRL transforms conventional business reports (such as in MS Word, PDF, or MS Excel format) into a computer-readable format (Gomaa et al., 2011). In traditional financial reporting processes each division supplies the financial reports into, for example, the Accounting Information System (AIS),

which then produces different types of output (PDF, CSV, or Excel). The generated reports are then being submitted to different institutions as the requesting parties, such as, the business register, tax administration, or other regulatory agencies (Eierle et al., 2014). Then, the requesting parties have to manually convert and process the submitted information into their internal applications for further analysis (Eierle et al., 2014). Activities prior to analyzing received reports, such as data conversion, data matching, or data cleaning with traditional reporting mechanisms, are laborious, time-consuming, and resource-intensive in the organization, and often limit more important analytical activities.

XBRL aims to improve business information reporting efficiency from the perspectives of data producers, processors, and consumers. XBRL can also make the information can be distributed faster along the information chain. Implementing XBRL is beneficial when organizations need to report more often, require high accuracy, have complex data, are intended to re-use all or some of submitted data, and reduce manual processing, which is usually prone to errors and expensive. Perdana et al. (2014) presented potential benefits of XBRL in the financial reporting system. They divided the benefits into three aspects: (1) accounting, (2) auditing, and (3) decision-making process, for three key actors: (1) providers, (2) intermediaries, and (3) requesters. In accounting, potential impacts of XBRL includes the development of an integrated accounting and financial information supply chain (O'Riain et al., 2012), improved accounting data and financial information quality by facilitating information-sharing (Baldwin et al., 2006), and achieving good corporate governance by providing more transparent financial processes (Kim et al., 2012). In auditing, XBRL provides the opportunity and capability to handle continuous auditing (Rezaee et al., 2001), which is realized by the traceability of the data on the system. With this capability, auditors can focus on the evaluation of financial information rather than on extracting and calculating financial data (Khadaroo, 2005). Last, with the improvement in information quality and capability of data tracing and aggregating, XBRL also can improve the decision-making process (Asadi, 2014) and reduce information asymmetry between organizations (Geiger et al., 2014).

XBRL architecture is built based on the XML standard. The XML standard allows semantically expression of data and defines data model in XBRL (Rawashdeh & Selamat, 2013), while XML-based syntax defines the association of financial information with conceptual information of XBRL (Pinsker & Li, 2008). Moreover, the XBRL architecture consists of three main components: XBRL specifications, XBRL taxonomy, and XBRL instance (Wang & Wang, 2018), as shown in Figure 4-3:

1) XBRL specifications

XBRL specifications constitute the syntax rules and working mechanism that define how XBRL works by allowing multiple instance documents of different taxonomies to be processed (Doolin & Troshani, 2007). XBRL enables the creation of unique tags, a machine-readable barcode-like, identification for each individual reporting element, and allows a computer to recognize, process, and exchange the information across various platforms (Wang & Wang, 2018). XBRL specifications are the reference in creating the XBRL taxonomy and how to process XBRL instances.

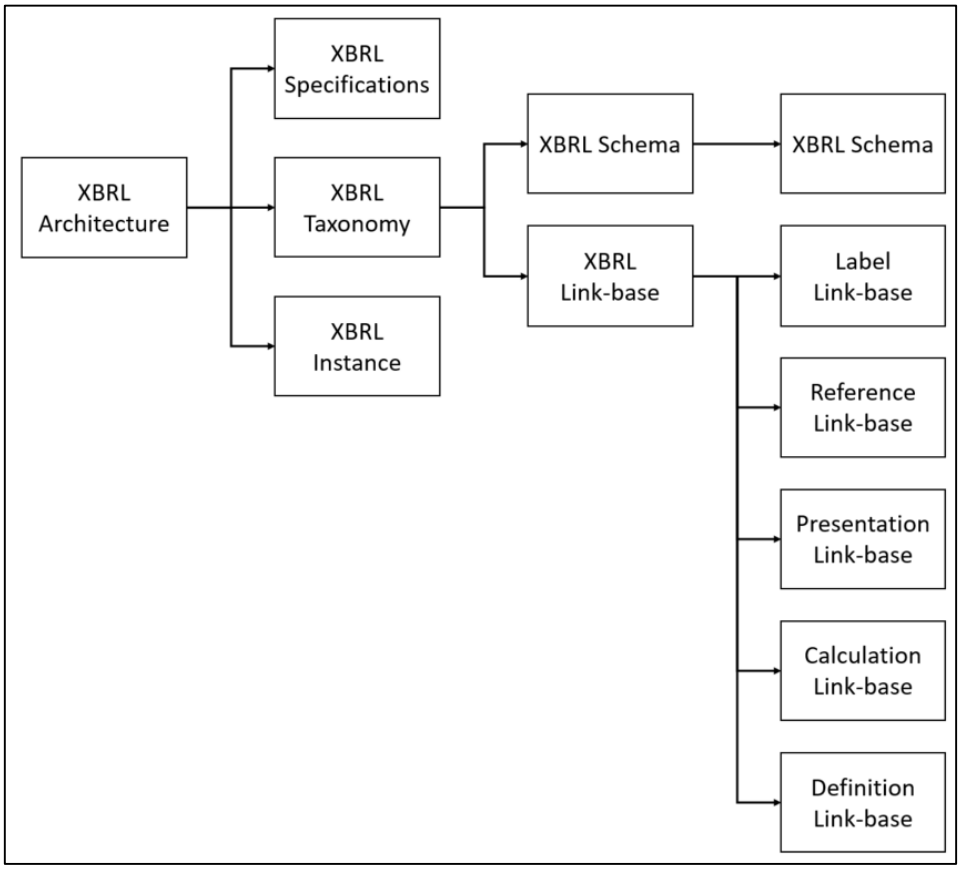


**Figure 4-3 XBRL Architecture, adopted from (Wang & Wang, 2018, p. 1214)**

2) XBRL taxonomy

XBRL Taxonomy is a catalog or set of rules which defines the specific tags used for individual items of data (Debreceny et al., 2009). XBRL taxonomy manages the narratives of data (consisting of the identifier, reference, definition, presentation, and calculation of data) and the languages to explain the narratives. Taxonomy can also be specified for certain types of financial reporting, for example, US GAAP taxonomy, IFRS taxonomy, or Global Ledger taxonomy. A taxonomy in XBRL functions as a dictionary with three components (Debreceny et al., 2009). The first component of the taxonomy is a machine-readable definition of business reporting terms (Debreceny et al., 2009). Second, the taxonomy establishes the relationships between the terms. Lastly, the taxonomy links these terms to human-readable resources. XBRL taxonomy consists of one or more XBRL schemas and link-bases related to them. XBRL schema is equivalent to words in a dictionary. XBRL schema defines information about elements, or business concepts (e.g., assets, liabilities, or income,) with their attributes (e.g., names, identifiers, data types, or period types) in a machine-readable way. XBRL link-base is basically a set of business rules that are used to describe and manage the relations between business concepts (Wang & Wang, 2018). Types of XBRL link-base defined by XBRL specifications are labels, references, presentations, calculations, and link-bases. A XBRL link-base provides a hierarchical structure of elements to improve the quality of data in XBRL instance and produce reports in multidimensional tables and human-readable documents (Wang & Wang, 2018).

3) XBRL instance documents (XBRL Entity)

XBRL instance documents contain the actual data representation and conceptual information based on the associated taxonomy (Wang & Wang, 2018). XBRL instance documents are basically financial

statements that are formatted with tags (Doolin & Troshani, 2007). The context of instance document consists of the accuracy, the entity, the segment, the scenario, the unit, and the reporting period of actual data (Müller-Wickop et al., 2012).

Research from (Garner et al., 2013) provides four adoption levels of XBRL: (1) non-adopters; (2) low adopters, by outsourcing the XBRL conversion; (3) medium adopters, reflected by retaining their current financial system and converting their financial data to XBRL in-house; (4) high adopters, which have potential to gain the optimal benefits from the system. From another view, (Sledgianowski et al., 2010) offer three XBRL adoption strategies for organizations: (1) bolt-on, using XBRL conversion at the end of the traditional reporting chain. Tagging of data is done after the internal reporting process is complete. This approach can be done internally or outsourced externally; (2) built-in, integrating XBRL (tagging and mapping capabilities) as part of reporting process without interfering other domains reporting system, for example, ones that still need manual conversion or use non-XML translation; (3) embedded, standardizing the internal reporting process by embedding tagging and mapping capabilities of XBRL in internal system, for example, in ERP or other core business applications.

However, XBRL might not be suitable for reporting processes in different domains, therefore, adoption using an embedded strategy might not be feasible in many organizations. Accordingly, most of the XBRL adoption are either bolt-on or build-in, although those approaches might not fully reap the benefits of implementing XBRL. From the inter-organizational perspective, levels of adoption can also be demonstrated by actively or passively contributing to the system governance, participating in decision-making processes, and involvement in problem-solving and information-sharing (Barrett & Konsynski, 1982). “As an open-standard, XBRL is independent of any hardware or software” (Asadi, 2014, p. 1775). XBRL requires supporting software in the data exchange processes for bolt-on and build-in approaches. There are two types of software needed by XBRL users: tools to produce instance documents and tools to consume instance documents (Doolin & Troshani, 2007).

### 4.2.2 Case 1: Standard Business Reporting (SBR)

#### 4.2.2.1 Development of SBR

Standard Business Reporting (SBR) is a public-private arrangement that facilitates the standardization of information-sharing between businesses and governments, enabling qualified information exchange to reduce the administrative burden in the financial reporting process. Qualified information exchange can be achieved if it meets several conditions based on the principles of effectiveness, implementation and compliance, including the implementation of user access guidelines, adoption of process standardization for preparing, sending, receiving, and processing data, adoption of data standards and other technical protocols (Bharosa et al., 2018). Businesses must provide information (including reports, registrations, statistics, and assessment results) to the government to show that they comply with a certain regulation. For example, the Tax Office wants income tax filings, turnover tax filings, and VAT filings; The Chamber of Commerce wants annual reports signed by registered accountants; and the Office of Statistics wants various types of data about services or products. Companies have to provide this information by national law, so complying with the information request is mandatory. Not only do public institutions demand business information, private organizations also want to see reports from each other. For instance, when a business has credit loans at a commercial bank, banks request credit reports from companies. SBR is adopting the

standardization of data, the standardization of processes, and a centralized platform in the network between reporting parties and requesting parties to achieve the objective.

SBR replaces previous information-sharing systems, including the paper-based filings and prior digital arrangements, and enables the government and businesses to have an "unequivocal, cost-effective, secure, and adaptable method" (Bharosa et al., 2015, p. 2) for information-sharing. SBR is expected to bring many benefits, including, improving reporting processes, reducing communication and administration costs, and improving data quality. Some other benefits, which can be considered as derivative benefits, can also be realized, for example, enabling business process reengineering of both reporting an requesting parties by implementing process standardization for information-sharing. SBR can also support industry value chain integration initiatives as organizations have gaining capabilities and experiences to utilize an integrated reporting process. Through process automation and the implementation of taxonomy, SBR provides automated auditing and continuous control monitoring throughout the information chain. In addition, SBR have delivered benefits to all kinds of public agencies across societal domains (e.g., financial, fiscal, social, health, housing, education) using a highly standardized inter-organizational information system for digital reporting (Bharosa et al., 2018).

SBR was considered a less-successful XBRL adoption during its initial efforts in comparison to other XBRL-based implementations (Chen, 2012). However, SBR is currently gaining international acclaim for its success in reducing administrative burden. The European Institute of Public Administration awarded SBR with the European Public Sector Award in 2015 and 2017. We created the timeline to help understand the main events that took place and analyze the important factors during the various implementation phases, as presented in Figure 4-4.

The initial program was started in 2002 when the Netherlands Ministry of Economic Affairs recognized the importance of using ICT to simplify the business reporting process. In that year, the Ministry created a program called *ICT and Administratieve Lastenverlichting* (or ICT and reducing the administrative burden), which is a cooperative venture with private organizations. One of the successful projects in this program – OTP *Overheidstransactiepoort* (OTP) or Governmental Transaction Portal – was the use of an electronic gateway for filing financial reports in several formats (Bharosa et al., 2015). The implementation of this system resulted in the recognition by involved actors, particularly the government, of the need to standardize financial reporting systems to avoid heterogeneity and fragmentation, as well as ensure the interoperability of information-sharing systems. Implementing standardization in data, process, and technology offers opportunities for the involved organizations to decide what configuration to use in the information-sharing system and how to achieve an optimal process flow to achieve the shared objectives. XBRL emerged as a data standardization choice due to its characteristics. To understand the opportunities and limitations of XBRL, many business cases were done for proof-of-concept while collecting requirements for system architecture and evaluating capabilities needed to arrange information-sharing in this phase.

The National Taxonomy Project (NTP), initiated in 2004, can be considered the starting point for the use of XBRL as the main standard in data exchange for SBR. NTP aims to create a common set of financial data definitions and meet the requirements of various financial reports. One of the benefits of XBRL is that it addresses the difficulties that occurred in the previous digital arrangements (especially XML-based). The same vocabulary could have different meanings. SBR can improve accounting data and financial information quality and make reporting data easier (Perdana et al., 2014). However, this standardization also requires a suitable information infrastructure, so in the same

year, the design of the generic infrastructure (GEIN) – a new interface of OTP that enables more modularity and flexibility in the information processes – was also started. In 2006, the design was completed, and the first version of the Netherlands Taxonomy (NT) was released.

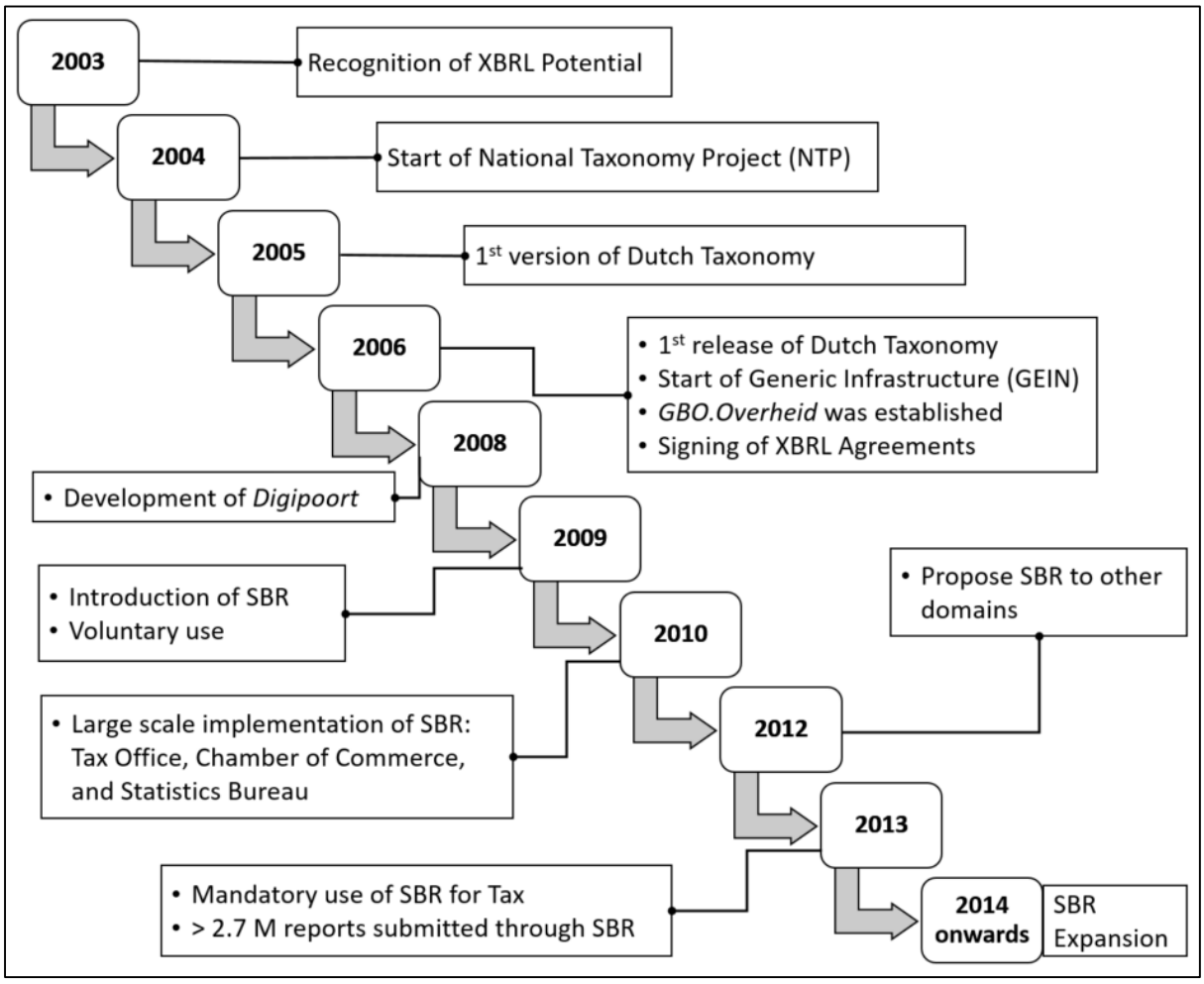


**Figure 4-4 Key events in the SBR Implementation, adopted from (Bharosa et al., 2015)**

The next process was to convince as many organizations as possible to adopt the Dutch Taxonomy as a tool for financial reporting. Capabilities to communicate the benefits and long-term plans, coordinate with companies and public organizations, deals with tensions of conflicting concerns, and be actively involved in the implementation (decisions) became necessary in this phase. The adoption of NT (and later SBR) was considered greatly assisted by the involvement of the Dutch tax authorities. The tax authorities provide a connection to all business entities and all government agencies in the Netherlands. Previously, the tax authorities were already using an XML-based reporting system in their back-office; thus, according to the respondents, no extreme transformation was needed and there was no resistance in the Tax Office. In addition, numerous meetings, including political lobbying, were conducted to establish the public-private governance consisting of NT stakeholders, from government agencies and companies. VNO–NCW (the Dutch employers' federation) played a role in this process to mediate the communication from government agencies to industries and within industries. This organization was also connected to all industry domains, in this way reducing effort in creating public-private governance and increasing the promotion of the NT.

In 2008, the development of *Digipoort*, based on GEIN, as the main infrastructure of SBR was started. *Digipoort* is a government-owned multiport platform for information-sharing-. Using *Digipoort*, the focus of the NTP was expanded to process business standardization in addition to data standardization. *Digipoort* is managed by *GBO.Overheid*, a public service center under the responsibility of the Ministry of Interior and Kingdom Relations. This agency was responsible for providing public e-services and is in charge of developing both the taxonomy and the shared infrastructure. Later in January 2010, *GBO.Overheid* was renamed into *Logius*. SBR was officially launched in 2009. The Netherlands Government started using the term SBR instead of NTP and redefined its objective, that is, to be a generic system-to-system (S2S) message exchange. From 2009 till 2013, SBR was still voluntary, with many trainings, workshops, and assistance organized by *Logius* and Tax Administration to companies, software providers, and other intermediaries (e.g., accountants or financial consultants). Accordingly, the use of the SBR started to grow, not only by companies in reporting to tax administrations but also for reporting annual financial statements and statistics, to the Dutch Chamber of Commerce and Central Bureau of Statistics and later, to other domains. Apart from the system architecture, the public-private governance structure of SBR has also begun to be established to support the coordination of companies and public organizations, including managing operational relationships among involved stakeholders, monitoring performance, dealing with problems and incidents, and to carry-out changes needed in the SBR.

With the increase in financial reporting using SBR in companies as reporting parties, companies at this stage have changed their internal business processes to suit the requirements of the SBR. Companies already have the knowledge and capabilities, especially regarding XBRL, as well as built and used XBRL tools to produce reports in the form of XBRL instance documents. As continuous improvement (starting the exploitation phase), monitoring and evaluation of the benefits realization from the implementation of SBR has also become routine activities, which forms the basis for developing SBR to be used in wider domains or in adopting new legislations. In addition, according to the respondents, the quality of the XBRL tools provided by the software providers, as one of the intermediaries, has improved (at a more competitive price) as a result of *Logius*' assistance and lessons learned from users' feedbacks and problems that arose during implementation.

A large volume of XBRL messages within the financial domains was exchanged using the system. In 2011, 87,000 value-added tax (VAT) declarations and 3,500 financial statements were processed through the system. The operational issues then become part of the focus of the program due to the high number of message exchanges. In 2013, the government decided to mandate the use of SBR as the exclusive channel for tax and customs reports and as the exclusive channel for VAT per 2014. One of the respondents mentioned that "*mandatory or implementing fine or penalty is only reasonable if the system already worked properly. In the SBR case, mandating is helping businesses. Because for businesses, when you are in a pilot project they don't know if they should invest or not, there is the possibility that government may end up changing and using a different standard or technology. So, when the government mandates it, businesses can start to invest. Businesses need to invest on their side in terms of knowledge, getting the right taxonomy in their systems, and also to get digital certificates. So, if the government says 'okay now we're sure this is a good standard', the market and private sectors will adopt it*". SBR started to expand the potential use of XBRL in non-financial fields in 2012, and the Chamber of Commerce mandates the use of SBR in 2017. According to the respondents, "*Making SBR mandatory is the final step to encourage adoption (in users) and can only be done if other things about SBR have been agreed*". After mandating the SBR, the number of financial reports

submitted through SBR increased significantly from around 2.7 million messages in 2013 to around 42.8 million messages in 2018. However, the increased number of messages submitted through SBR was not solely because of the regulation but also due to the benefit of SBR perceived by the users. This helped to extend SBR information-sharing to other B2G domains.

#### 4.2.2.2 Stakeholder Analysis

As mentioned in the previous section, SBR was started as the National Taxonomy Project (NTP), which was a collaboration of the Tax Office (under the Ministry of Finance), the Chamber of Commerce, and the Central Bureau of Statistics (Bharosa, Janssen, et al., 2011). Those agencies collaborated to identify solutions to reduce the administrative burden in the reporting chain. Along the time, the SBR goes beyond annual reporting and tax filing. The roadmap of SBR 2020, which was created by SBR Council and SBR Platform, comprises the planning for the implementation in multi-domains such as healthcare, education, agriculture, subsidies, and assurance. This means the Netherlands' SBR has started to apply XBRL beyond the traditional implementation of financial reports. This resulted in an increase in the number of stakeholders involved in the program.

There are four groups of SBR stakeholders: First, the Shared service center (SSC) administrators play a role as the point of reference to all stakeholders in the program. Then, the public authorities, including the Ministry of the Interior and Kingdom Relations, the Ministry of Economic Affairs and Climate Policy, the Ministry of Health, Welfare and Sport, and the Ministry of Education, Culture, and Science. Next, the government agencies mostly act as information requesters, including the Tax Office, the Chamber of Commerce, the Central Bureau of Statistics, and other agencies. Finally, Private organizations, including information providers, intermediaries, and software providers.

Based on the stakeholder model of (Fedorowicz et al., 2010) and (Klievink et al., 2012b), those groups can be divided as follows:

1) Data Controllers: the Tax Office, the Chamber of Commerce, the Central Bureau of Statistics, and other agencies.
2) Data Subjects: Private organizations (companies and banks).
3) Data Providers: Private organizations (companies and banks) that can also be assisted by third parties (intermediaries: consultants or accountants).
4) Secondary Stakeholders: other organizations, including the Ministries, software providers, SSC administrator (*Logius*), as well as XBRL International.

Figure 4-5 illustrates the relationship between the main stakeholders of SBR. *Logius*, as the SSC administrator, plays a substantial role as the single point of mediator that connects the interests of various stakeholders. From the official website, *Logius* is authorized to design, manage, and maintain solutions and common standards of the government-wide ICT, simplify the communication between government agencies, citizens, and businesses align with the e-government networks, and supply products related to access, data exchange, standardization and information security.

*Logius* is supervised by the Ministry of the Interior and Kingdom Relations and commissioned by three Ministries, including the Ministry of Economic Affairs and Climate Policy, the Ministry of Health, Welfare, and Sport, and the Ministry of Education, Culture, and Science. These ministries represent the domain of the current SBR. As the authorities, they are influencing the SBR through their representation in Steering Committee, mandating the use of SBR via regulation, and approving funding

of the SBR. Their main interests are to ensure proper implementation of SBR in terms of business and ICT solution. On top of that, the objective to reduce administrative burdens in reporting is met.

SBR is established to standardize reporting mechanism for the government, so it covers G2G and B2G information-sharing. Government agencies can be information requesters and information providers. Tax and Customs Administration (*Belastingdienst*) are the first major agency to user SBR, as the program at the beginning started in the tax reporting domain. The involvement of *Belastingdienst* in the early phase of SBR was critical. Their role spans from the main source of funds, policy-making principal, chairman of the Steering Committee, to the technical aspect of SBR, and providing requirements and feedback for continuous improvement. SBR was then used by Chambers of Commerce (*Kamer van Koophandel* or KvK) and Statistics Netherlands (*Centraal Bureau voor de Statistiek* or CBS). The architecture of the SBR, especially the taxonomy, consequently was extended to include requirements from these agencies. Funding was then also allocated and divided according to the respective domains. The use of SBR by major agencies, such as *Belastingdienst*, KvK, and CBS, is acknowledged as one of the critical factors in the adoption and growth of SBR ((Bharosa, van Wijk, et al., 2011).

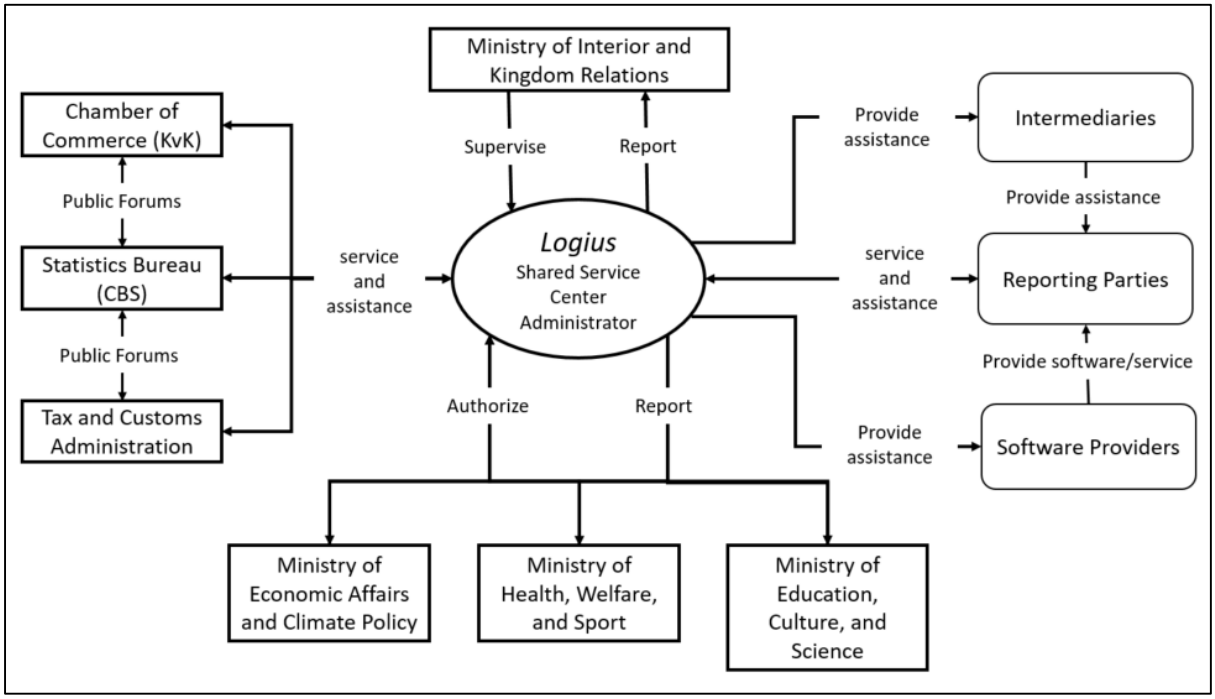


**Figure 4-5 Relationship between SBR stakeholders (taken from (Sulastri, 2016, p. 44))**

SBR stakeholders from private organizations include information providers, software providers, and intermediaries. Information providers or reporting entities are companies required to submit their reports to government agencies. They are the main target of SBR; in the sense that if the administrative burden felt by the reporting entities is not reduced, then the SBR can be considered a failure. Moreover, one of the main differences between SBR, as an XBRL-based reporting system, compared to other XBRL implementation, is related to how SBR builds the ecosystem for its adoption. This is done in collaboration with various parties. Software providers and intermediaries are parties who are also invited to cooperate in the adoption of SBR. Most companies, especially Small and Medium Enterprises (SMEs), are highly dependent on the intermediaries and software providers in doing tax reporting and

other financial reports. Intermediaries, for example, tax consultants, have been helping companies to translate their internal data into required data for compliance purposes. Software providers are needed to provide tools to produce XBRL instance documents in accordance with Netherlands Taxonomy. During the implementation of SBR, *Logius* has also provided intermediaries and software providers with necessary assistance to ensure products and services offered by those entities are in accordance with the requirements of SBR and prevent potential errors both in the data presentation and in the sharing processes.

The existence of *Logius* as SSC administrator in the SBR implementation is one element that distinguishes SBR from other XBRL-based reporting system implementations. *Logius* simplifies the roles of other stakeholders by being a point of reference. Because *Logius* is supervised by regulators, compliance requirements can already be embedded in the design and implementation of the SBR (Bharosa, Janssen, van Wijk, et al., 2013). Interaction between stakeholders has been built for a long time, with clear roles and responsibilities for each stakeholder. Negotiated solutions align with clear common goals became the basis for decision-making in public-private governance. Stakeholder relationships are built in a directed manner and are beneficial in limiting the power asymmetry among stakeholders. The downside is that the implementation takes a long time and takes several stages of proof-of-concept. The level of capability in both organizational and IT aspects is not a big issue, because the previous arrangement was already used to an XML-based digital system. Moreover, in providing XBRL tools for users, there is assistance by *Logius* for software providers. In adoption, *Logius* also provides a technical support team to help users in reporting on SBR.

#### 4.2.2.3 Type of Information-Sharing Arrangements

In this section, we present the type of information-sharing arrangements adopted by SBR. The information-sharing arrangement is described using the aspects identified in Chapter 3. As discussed, SBR is characterized by three key principles: the first one is the standardization of data, processes, and technologies throughout the information chain; second, cooperation between the public and private sector to set up a public-private governance structure; and third, compliance-by-design, to capture compliance requirements through a generic requirements modeling framework (Sadiq & Governatori, 2010). The first principle is related to system architecture, the second principle is about system governance, and the third principle manifests the interplay between system architecture and system governance. In conducting analysis in the case study, we used analytical lens provided in Figure 4-2 and Table 3-9.

1) The architecture of information-sharing system in SBR

There are four main elements of SBR architecture (Bharosa et al., 2015): first, data specifications, in the form of XBRL as the data standard, and the Netherlands Taxonomy (based on XBRL taxonomy) accommodates data requirements for the reports to be adopted and used across domains. Another note is that the implementation of XBRL in the Netherlands uses either a bold-on or build-in approach. Simply put, both approaches do not require XBRL to be adopted a d embedded in the whole organization's information system. Consequently, the Tax Office translates XBRL messages to XML messages to consume the reported data. However, this is less costly, considering that XML has matured to be used in the legacy Tax Office's information system, and the translation is not complicated, because XBRL is a derivative of XML. In addition, using both approaches is considered

more flexible and simpler. There is no need for a lot of investment to replace the existing back-office technology. In this way, it is also an opportunity for software providers to provide services or products to accommodate XBRL.

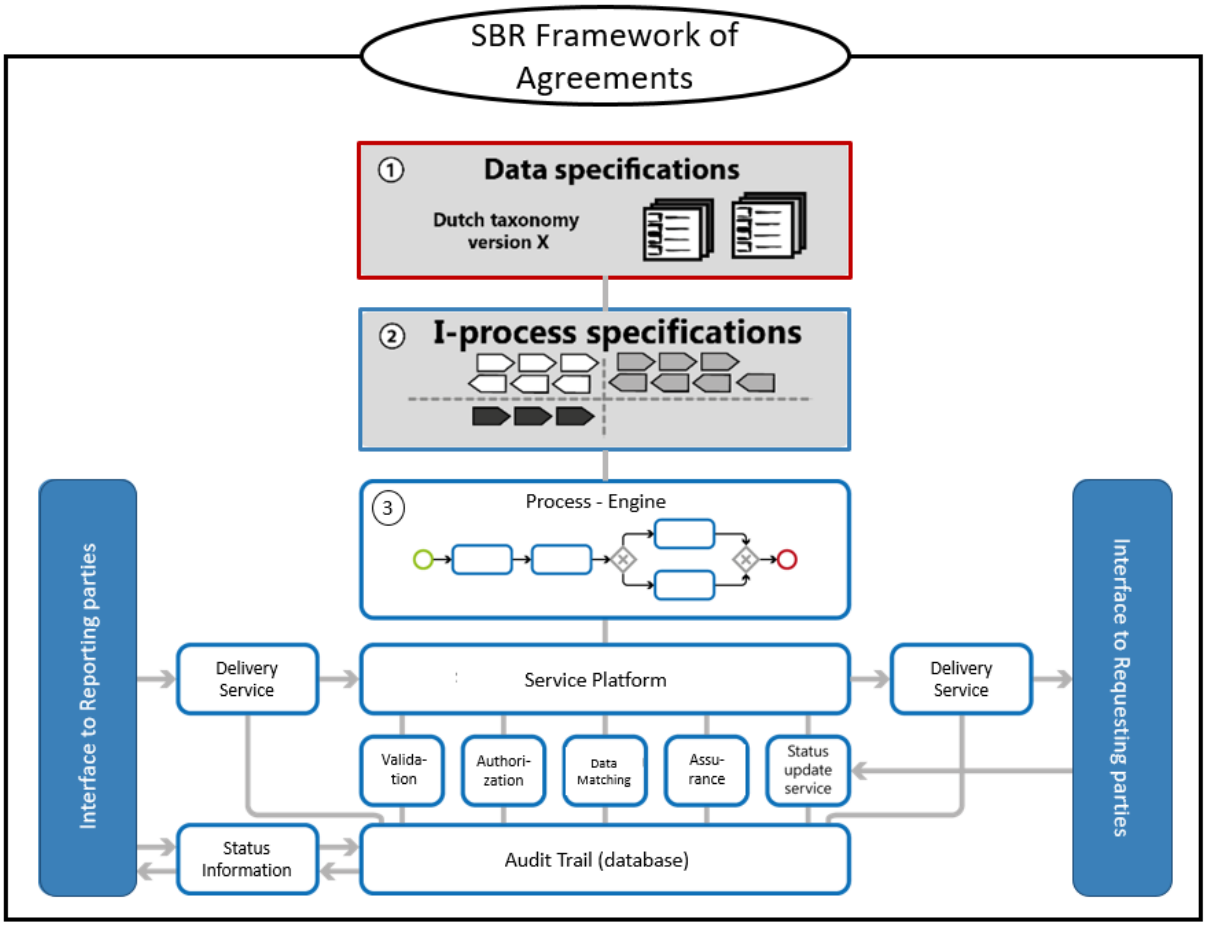


**Figure 4-6 SBR Architecture (adopted from (Bharosa et al., 2015))**

*Digipoort* comprises the second and third elements, process and infrastructure standardization. The second element is the process standardization called I-process. This element identifies and defines generic processes needed to enable system-to-system (S2S) information-sharing. The I-process is made in such a way that it can allow, if necessary, adding or removing certain processes in the chain for a particular report or domain. The description of how an interface service operates is also included in the I-process specification. The Bolt-on approach required interfaces to translate data into XBRL, send messages from reporting parties to *Digipoort,* and then deliver messages from *Digipoort* to requesting parties. Once the reporting parties use XBRL for their internal financial processes (build-in approach), reporting the information should become even easier, simpler, and cheaper. *SBR does not exclusively use Digipoort itself as a shared infrastructure*, others information-sharing can also use *Digipoort*, for example, are SBR Banking and Automatic Exchange of Information (AEOI).

I-process specifications are delivered using the process engine, the third element. Process engine defines how processes are followed step-by-step. The process engine is implemented using a service platform that consists of modular services, including validation, authentication and authorization, data matching, assurance, and status update service. The shared data from the reporting parties undergo

several processes assigned by the I-process, including the authentication of the sender, validation of the data based on the taxonomy and reuse of data according to the requirement of the requesting parties (which already is defined in the taxonomy). These processes also act as a buffering system in dealing with huge amounts of data. Therefore, there is no centralized storage in SBR. This reduces the chances of security breaches and keeps the ownership of the shared data in the hands of the reporting organizations.

The final element is the SBR Framework of Agreements. This framework provides guidance on the legal and regulatory configuration of the information chain for a particular report and includes agreements explaining which standards are applied in the SBR (Bharosa et al., 2015). SBR is not tied to a specific technology but adopts proven, widely used, open technologies that support the exchange of structured data, define data model, and enable the unequivocal design and definition of processes. Currently, SBR uses technologies such as SOAP, BPMN and XBRL. Although XBRL is currently considered as the most suitable standard for the needs of the reporting system, it is possible to be replaced.

From the information-sharing arrangements framework provided in Chapter 3, the SBR architecture is implementing a **centralized – multilateral** type. To accommodate the reporting from the reporting entities to the government agencies, SBR has been using a **Government Service Platform** (GSP), which is designed as the intermediary that enables inter-organizational information-sharing. GSP employs the star-shaped network so that any organization that wants or requires to exchange the information can connect to the GSP through the interface from their internal system (Yang et al., 2014). Moreover, another characteristic of the multilateral architecture is that it could facilitate information-sharing from reporting parties (especially companies, banks, or other private organizations) with many government agencies in the Netherlands. In this case, the multilateral information-sharing system enables the interconnection with all the partners, and the reporting entities do not need to build a direct connection to each information requester (Choudhury, 1997).

Moreover, in terms of data management, *Digipoort* does not store the report being sent from the financial institutions, rather it only acts as the hub that routes the report to the requesting entities' internal system. Thus, according to (Bekkers, 2007), *Digipoort* can be categorized as the **information broker** type of data management. The next parameter is the level of integration. Using a highly standardized inter-organizational information system for digital reporting, SBR provides integration of processes and activities within and across many reporting chain, from businesses to many public organizations. Therefore, SBR can be classified into **horizontal integration** (Layne & Lee, 2001) and **inter-organizational integration** (Klievink & Janssen, 2009).

2) The governance structure of SBR

According to the respondents, the governance of SBR is one of the key factors in the adoption and growth of SBR. The governance structure provides the decision-making structure, rights, responsibilities, and formal communication among stakeholders. The SBR governance changed over time and is intrinsically connected to the information-sharing architecture (Janssen & Tan, 2014; Tiwana & Konsynski, 2010). Three principles were used in establishing the system governance of SBR: i) rigid, to guarantee the stability of cooperation and architecture, using precautionary, proportionality, and equality in the decision-making processes; ii) flexible, to guarantee adaptability of new solutions, extensions or new chains; iii) utilize existing public-private relationship, especially in the early phase of SBR between Tax Administration, companies, tax consultants, and tax software providers.

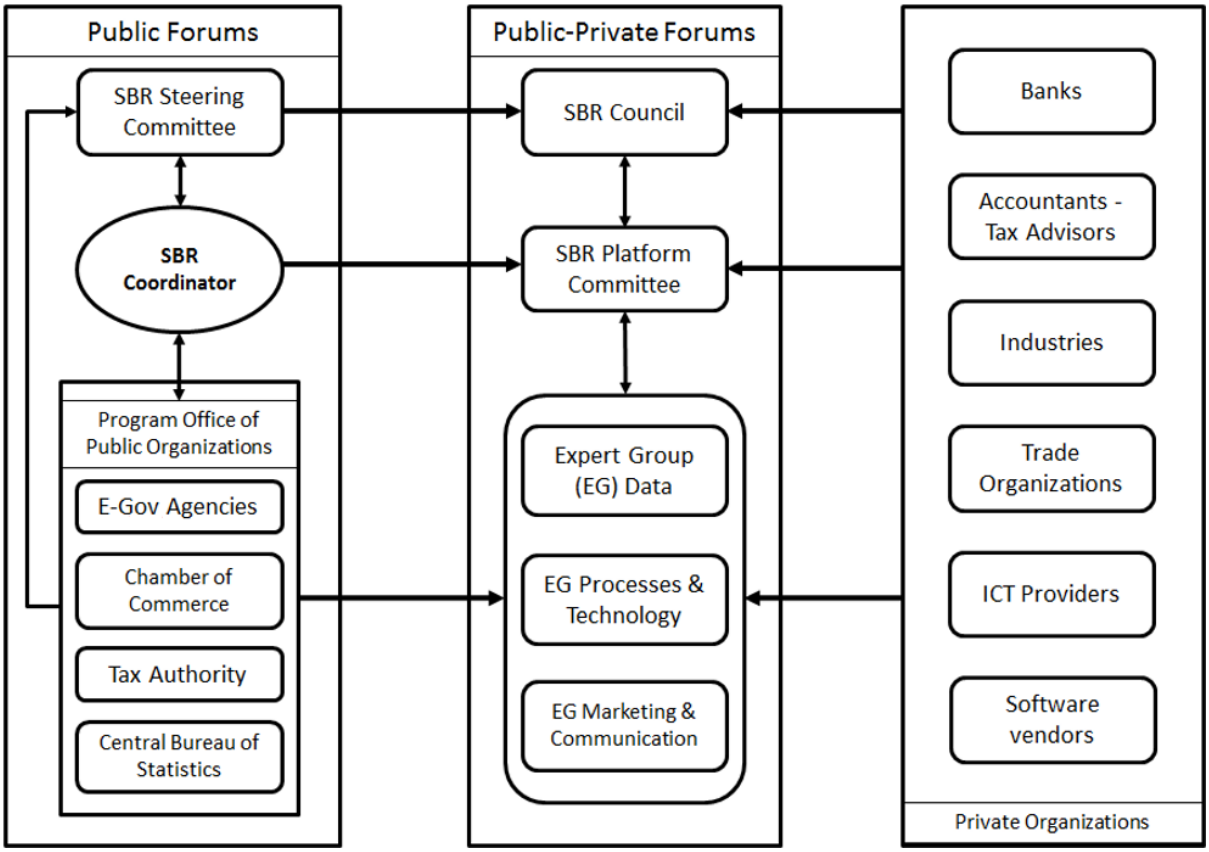


**Figure 4-7 SBR Governance Structure (adopted from (Bharosa et al., 2015))**

As depicted In Figure 4-7, the governance structure of SBR consists of the public SBR forums, the public-private SBR forums, and a group of private sectors. The public SBR forums deal with the administrative authority of the public-private forums, compliance and regulatory needs, public investments for SBR, and G2G relationships. The top hierarchy of the forums is the SBR Steering Committee, which is composed of representatives from all government agencies. This Committee handles the strategic level, including future expansions of SBR and its information infrastructure. The tactical level in the forums is the SBR Coordinator group, which is composed of representatives of all project leaders at government agencies. This section handles the monitoring and evaluation of the costs and activities at the operational level. The operational level in the forums comprises experts from government agencies working together with expert groups in the public-private forums to resolve issues regarding the services, identify the need to change processes or taxonomies, and determine the impact of such changes.

The public-private forums responsible for SBR development regarding network integration, including compliance with the SBR standards, government regulations, and other financial/accounting standards. The forums' structure can be changed over time, for example, because of the shifting focus of the development or the involvement of different stakeholders. The highest hierarchy of the SBR public-private forums is the SBR Council, as the strategic level, which is composed of top-level management from government agencies and businesses. The main job of the Council is to define the framework for using SBR in the longer term, including how to market this system to be used in other domains. The second layer is the SBR Platform, as the tactical level, which consists of representatives from businesses and government agencies with hands-on experience who identify issues that affect the adoption. The operational layer, as mentioned earlier, is the SBR Expert groups. There are three

expert groups in the SBR public-private forums, each addressing the following areas: Data, Process and Technology, and Marketing.

As discussed before, there is a hierarchical structure in SBR Governance. SBR Council deals with strategy, SBR Platform is responsible on the tactical level, and Expert Groups handle the operational level. Each governance entity is formed in the form of collaboration by various organizations. It is important for every involved organization to contribute to every decision-making at every level in SBR. The government needs to ensure that the required data in the reports are met according to the applicable requirements and laws. Whereas for companies, representation and involvement in decision-making can influence the investment they need to be made, manage resources, and deal with any challenges in the implementation (Janssen & Tan, 2014). The representation of both parties in the governance structure results in negotiated solutions and stronger legitimacy for the decisions made. Accordingly, because of the collaborative approach in each level's governance entity, every involved organization becomes units in a network structure. Therefore, the SBR governance structure adopts a combination of hierarchical and network, called **hybrid** or **heterarchical** (Cumming, 2016).

The structure of information-sharing arrangements for SBR is summarized in Table 4-2.

**Table 4-2 Structure of information-sharing arrangements in SBR**

| Aspect | Model | Case: SBR |
|---|---|---|
| System Architecture | Network typology | Government Service Platform |
| | | Multilateral |
| | Data management approach | Information Broker |
| | Level of integration | Horizontal Integration |
| | | Inter-organizational integration |
| System Governance | Type of stakeholders | All identified |
| | Decision-making structure | Heterarchical |
| | Information-sharing enablers | Mandatory |

#### 4.2.2.4 Factors Influencing the SBR Arrangements

In this section, we discussed factors influencing SBR arrangements. As presented in the previous part, SBR uses a multiport platform owned by the government (*Digipoort*) to implement technology, processes, and data standardization. Government-to-government collaboration as the basis of the arrangements is extended to B2G/G2B and even B2B. The decision to develop national taxonomy which accommodates reporting requirements from many government agencies leads to an integrated architecture. SBR implements a public-private governance structure to govern and manage the way decisions are made, establish roles and responsibilities among stakeholders, and ensure negotiated solutions are prioritized daily. This is all wrapped up in the stakeholders' framework of agreements.

**Perceived benefits** is the first factor identified in the SBR case. The how is driven by the why. As SBR aims to simplify the administrative process of compliance with regulations and is intended to be used across domains all innovations, activities, improvements, and changes to the SBR aim to achieve these goals. One of the respondents stated that "the main trigger of SBR is the need to have digitalization process cheaper and easier for the companies who have to send the information to the government, and also to make it cheaper and easier for the software developers who build the

software for the companies and for the intermediary parties. That is why SBR uses XBRL, BPMN, and other open standards and is supported by the use of public-private-structure".

The second identified factor from SBR is the **diversity of users**. To reduce administrative burden, SBR is designed for cross-domain usage. Companies can submit reports to many government agencies, including Tax Administrations, Chamber of Commerce, Statistics Bureau, and others; either using the same taxonomy or developing a different taxonomy (e.g., for SBR Banks). SBR then requires governance and architectural solutions that can accommodate the needs of those varied users, including data requirements for each report or requirements for different types of companies (reports from SMEs and MNEs might be different), as well as potential heterogeneity of IT systems of providers and requesters.

Third, **trust in sharing partners**. Trust is reflected in the strong contributions of involved organizations in the SBR decision-making process of the system, even though involvement in the governance structure is voluntary. Inter-organizational trust in SBR has been built by utilizing existing relationships between companies and government agencies. This means it built over time with more positive experiences and transparency in decision-making, contributing to increased trust between organizations. Building relationships and ecosystems with many parties, conducting many use cases as a proof-of-concept, encouraging participation of all stakeholders, and involvement of big public organizations were steps that contribute to the level of trust between organizations in SBR. In addition, the increased level of trust in sharing partners in the SBR is also shown by the delegation of authority in the change and improvement of the national taxonomy, which was previously fully by the government to become open to other stakeholders.

As previously mentioned, the adoption strategy of SBR, particularly in the earlier phase, relies on existing **inter-organizational relationships** between *Belastingdienst*, companies, tax consultants, and tax software providers. Governance structure in the early phase was also adopting the prior governance structure of the tax reporting system, which is considered useful to reduce the conflict that potentially occurs during the early phase. As SBR is adopted in many domains, "new" participants (both reporting and requesting parties) can learn from prior relationships and working together to improve the SBR.

Next factor is **power asymmetry**. SBR was started as a government program, so that in the initial phase of development, design, POC projects, and investment are under the authority of public organizations (especially *Belastingdienst*). Then it was realized that in order to increase the adoption of SBR (in which realizing more benefits), power asymmetry should be limited while promoting collaboration and negotiated solutions, therefore, a public-private governance structure was implemented.

**System quality** and **system security** are also identified as factors influencing SBR arrangements. As presented in Table 4-3, *Digipoort* applies some techniques or methods to fulfill each technical requirement from infrastructure, application and data, and business process layer. Sending notifications of errors or activities, collecting activity logs, and enabling audit trails are assurance that neither the senders nor the recipients can deny having made a transaction in the system. The application of encryption for the channel and the message along with user authentication and authorization in accessing and processing the sent message are the confidentiality aspect implemented in SBR to ensure that the shared data are restricted to those authorized. Interface protection, signed message, and digital signature are implemented to confirm the integrity of the messages or shared data, and that the messages were not altered in transit. In addition, SBR also applies certain levels of

identification, including user identification, message identification, and partner identification, to ensure that messages are sent by the sending party and then processed and used by the appropriate requesting party according to the intended purposes. A reliable system is also necessary to manage more than 42 million messages annually, to perform all the required functions under the specified conditions for a given period of time. Then, to ensure the correctness and accuracy of the data in the report, there are three validation processes implemented, ranging from interface compliance check on the communication level, validation of the schema and content of the messages compared to the taxonomy, to checks whether the business rules in the report are correct.

**Table 4-3 Requirements of SBR Architecture (based on (Bharosa et al., 2015))**

| Requirements | Communication level | Application & data level | Business process |
|---|---|---|---|
| Non-repudiation | Transport confirmation, Reliable messaging | Acknowledgment Logging | Audit trail |
| Confidentiality | Encrypted channel | Encrypted message | Authorization, Delegation (power of attorney) |
| Integrity | Interface protection | Signed message | Digital signature |
| Reliability | Buffering | Securing messages Retransmit messages | Archiving |
| Correctness | Interface compliance check | Schema validation, content validation | Business rule validation |
| Identification | Resource identification | Message identification | Partner identification |

**Technical compatibility** is another factor identified in SBR case. To ensure this requirement is realized, the SBR was developed by taking into account the internal system of the Dutch Tax Office (because at first the Tax Office was the main stakeholder of the SBR) and the reporting parties. *Belastingdienst* has previously implemented an XML-based information system on their internal system. For the adoption of the SBR (XBRL is a derivative of XML) that adopts standardization of data and processes, in the *Belastingdienst* system the translation process of the received data before it is processed. On the other hand, reporting parties need applications to generate XBRL instance documents in accordance with the Dutch Taxonomy. They can build this application themselves or can also purchase it from software providers. In the development of the reporting applications, *Logius* provides assistance and supervision to ensure the suitability of the application built with technical and compliance requirements. Later, the assistance and supervision from *Logius* transformed into a support system mechanism which available for **technical support** (including providing manual of reporting through SBR and helpdesk) for SBR operations.

The influence of **organizational culture** on the development of SBR is mainly examined from the side of the Dutch Tax Office. We get the impression of a collaborative, open, and innovative culture embedded in the organization. It is not surprising that according to some of the respondents we interviewed, resistance to SBR implementation was almost non-existent. There were several concerns that we caught, especially regarding the importance of adopting XBRL, considering that the XML-based reporting system that was previously implemented had been operating quite well. However, as the SBR is being operated by personnel actively involved in the governance of SBR and become regular speakers as experts in international XBRL forums to share knowledge and explain the future plan XBRL implementation in the Netherlands.

### 4.2.3 Case 2: Banking Reporting System

#### 4.2.3.1 Development of Reporting System for Sharia Banks

At the time this research was conducted, there were plans to develop 3 XBRL-based reporting systems in Indonesia: Sharia Bank Reporting System by Indonesian Central Banks (*Bank Indonesia* or BI), Reporting System by Indonesian Stock Exchange, and Reporting System by Indonesia Financial Services Authority (*Otoritas Jasa Keuangan* or OJK). These three systems are built on the authority of these State institutions. Only the first system has been used for the reporting purpose, the Sharia Bank Reporting System, so we chose this system as the case study. BI started to design an XBRL-based reporting system in 2010 (Sugalih & Pahlisa, 2015). The main driver of this initiative was the need to simplify and integrate various existing banking reporting systems by developing a new, integrated, reliable, and stable reporting system based on international standards for business reporting due to current application inflexibility.

According to the respondents, the prior reporting system was inefficient, using unstandardized data definition, multiple and fragmented applications, and adopting various technology. Quality reporting was also needed to maintain monetary and financial system stability. A reporting system that would be responsive to business change and enable coordination between institutions was needed. Critical requirements for the reporting system are the implementation of standardization in information and mechanism to obtain it, simplifying existing information system, implementing international accounting standards, and continuity of system enhancement.

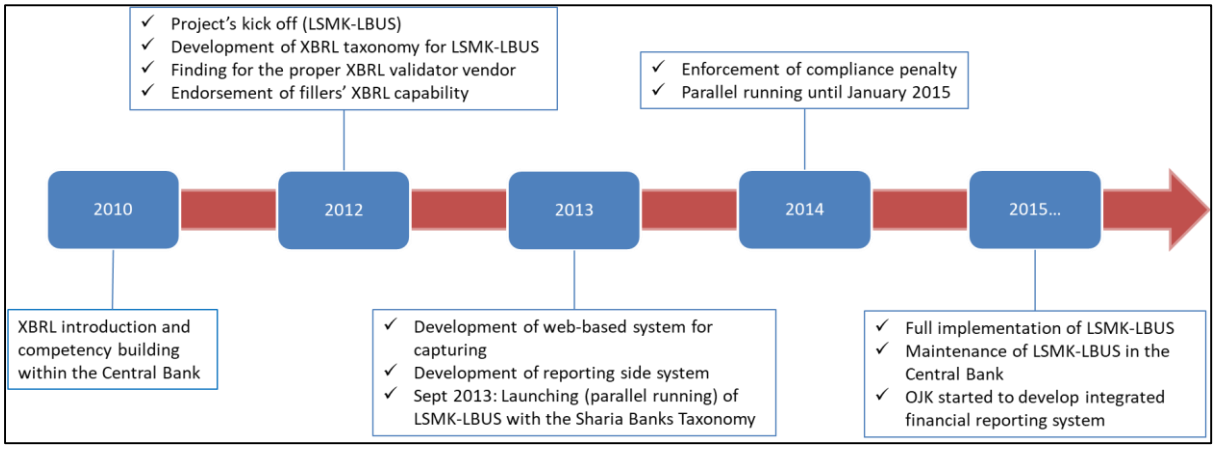


**Figure 4-8 Key events in the implementation of LBUS**

In the period 2010 to 2011, BI carried out many activities in order to improve XBRL capabilities. Among these were attending XBRL International's seminars and workshops, organizing XBRL training for employees and fillers, joining XBRL International as a direct member, and conducting comparative studies with other central banks. Pre-2018, common practice in the Banking Supervision was BI evaluates the needs of banking reporting, if new data or reports are needed, BI then issues new regulations that require the Banks to make and submit the new reports. BI also develops applications to support these reporting processes, either by adding functions to old applications or by creating new applications. Business units (*Satuan Kerja* or Satker) were responsible for collecting and submitting

user requirements. The development of the applications is carried out by IT Units (*Departemen Pengelola Sistem Informasi* or DPSI). In total, there are 11 applications as the core applications of the Banking Reporting System; including the accommodation of different types of banks (Commercial Banks versus Sharia Banks), reporting periods (daily, monthly, and periodic), and types of data (financial statements, statistics, credits, tax, and others).

There are several things that make integration difficult to do for the banking reporting system. Data integration requires daily data to be aggregated into monthly data. However, it turns out it is difficult to do, because some adjustments may be made in a certain period, making monthly data does not equal daily data aggregation. Another difficulty was that the unit that prepared reporting data at the banks could be different and have a different perspective. For example, data on maximum credit disbursement, for daily data is carried out by the risk management unit, but for monthly data it is carried out by, for example, treasury unit.

Moreover, post-2018, there is an additional issue due to the division of authority between BI with OJK, which in Indonesian law has the authority of Banking Supervision, and LPS, which has the authority to guarantee customer savings. Those organizations also need data and reports from the Banks. Therefore, previously, the integration of reporting in one institution was already complicated, post-2018 to build an integrated reporting system, it should be done in cross state-institutions, each of which has the authority based on law.

The development of the Sharia Bank Reporting System (officially known as *Laporan Bulanan Bank Umum Syariah* or LBUS), which is an XBRL-based financial reporting system application intended for Sharia Banks, has started in 2012. The information to be submitted through LBUS includes balance sheets, profit/loss statement, detailed list of assets, detailed list of liabilities, cash details list, and list of savings and current account. This application was then developed as a part of the monitoring program for financial and monetary system stability. Regulators used this to monitor the activities, conditions, and performance of Sharia banks. The development processes comprise several main activities, such as the projects' kick-off to improve stakeholders' awareness on the benefits of XBRL, the development of XBRL taxonomy, and the development of the reporting application. In addition, BI also sought advice and support from local, regional, and international XBRL community. Furthermore, as part of the task to build a system that is able to process large XBRL instance documents, BI needed to find the proper XBRL validator vendors. BI conducted several cycles of proofs-of-concept during one year period to find the most suitable candidates for the validator applications.

In 2013, the development of a web-based application for reporting was initiated to support the uploading process, validation, submission report, and monitoring. The information providers (i.e., Sharia banks and Sharia business units) also need to develop their own system aligned with the reporting requirements. BI has also started to ratify the readiness of XBRL fillers (Sharia Banks) through awareness programs, coaching clinics, and testing for reporting mechanisms. This step was taken to ensure that applications from both sides (BI and fillers) can run properly in the test environment and in real conditions, to evaluate whether the applications were made according to the requirements (especially in translating XBRL taxonomy), as well as to understand potential errors which may deter or delay reports submission. In September 2013, the LBUS was officially launched. Until 2014, this new system (LBUS) was run in parallel with the old one. The full implementation of LBUS was started at the beginning of 2015. Fully enforcement of the regulation (including the penalty) was commenced in 2015, which means since January 2015, Sharia Banks were obliged to submit their financial reports only using LBUS.

Unlike in SBR, XBRL-based reporting systems in Indonesia were implemented by different regulators using different taxonomy, different mechanisms, and, consequently various applications. The taxonomy used in LBUS could not be used for the Stock Exchange Reporting System and OJK Reporting System. One of the main purposes of LBUS is as a proof-of-concept of the XBRL implementation in a limited scope. XBRL is only used for one reporting application, while other reporting applications in BI use varied data standards and formats. This causes some of the data have to be submitted repeatedly using other applications for different reports. The quality of Sharia Banks after implementation of LBUS is actually improved according to respondents, however, in terms of effectiveness, the whole reporting system is still ineffective for both reporting and requesting parties.

The LBUS development project aims to understand the real benefits, potential challenges, and user adoption approach, while assessing the readiness of all stakeholders to implement XBRL. However, the expectation toward the use of XBRL as the main data standard throughout all reporting applications (and later Standard Reporting Platform) is considered low. Therefore, not many of the expected benefits from implementing XBRL have been realized according to the respondents, although lessons learned (i.e., the need for national taxonomy and standardization of data) from developing LBUS were later beneficial in developing the integrated financial reporting system.

#### 4.2.3.2 Stakeholder Analysis

There are four main LBUS stakeholders: the Central Bank of Indonesia (BI), Sharia Banks, software developers, and XBRL international community. Using the stakeholder model from (Fedorowicz et al., 2010) and (Klievink et al., 2012b), those organizations can be grouped as follows:

1) Data Controllers: the Central Bank (BI);
2) Data Subjects: Sharia Banks and its customers;
3) Data Providers: Sharia Banks which can also be assisted by intermediaries (accountants or consultants);
4) Secondary Stakeholders: Software Developers, XBRL International, Indonesian Deposit Insurance Institution (LPS), and Indonesian Financial Service Authority (OJK).

Figure 4-9 depicts the interactions between stakeholders of LBUS. Indonesian Central Bank has the main function of creating and maintaining currency (Rupiah) stability through monetary and payment system management and financial system stability. BI itself, just like Central Bank in other countries, is an independent state institution and free from interference from the government or other parties. As an independent state institution, Bank Indonesia has full autonomy in formulating and carrying out its duties and authorities as stipulated in the law. In LBUS, BI defines the requirements of the reports, sets the reporting standards, and provides the legal aspects of the reports. In implementing XBRL, BI is responsible for developing, testing, and validating the XBRL taxonomy for the LBUS. BI also provides assistance for the Sharia Banks in terms of business aspects, and technical aspects of XBRL implemented in LBUS. Software developers also provided assistance to ensure they built applications for the fillers aligned with the requirements and helped BI develop the web applications for report submission, particularly for report validator and taxonomy translator tools.

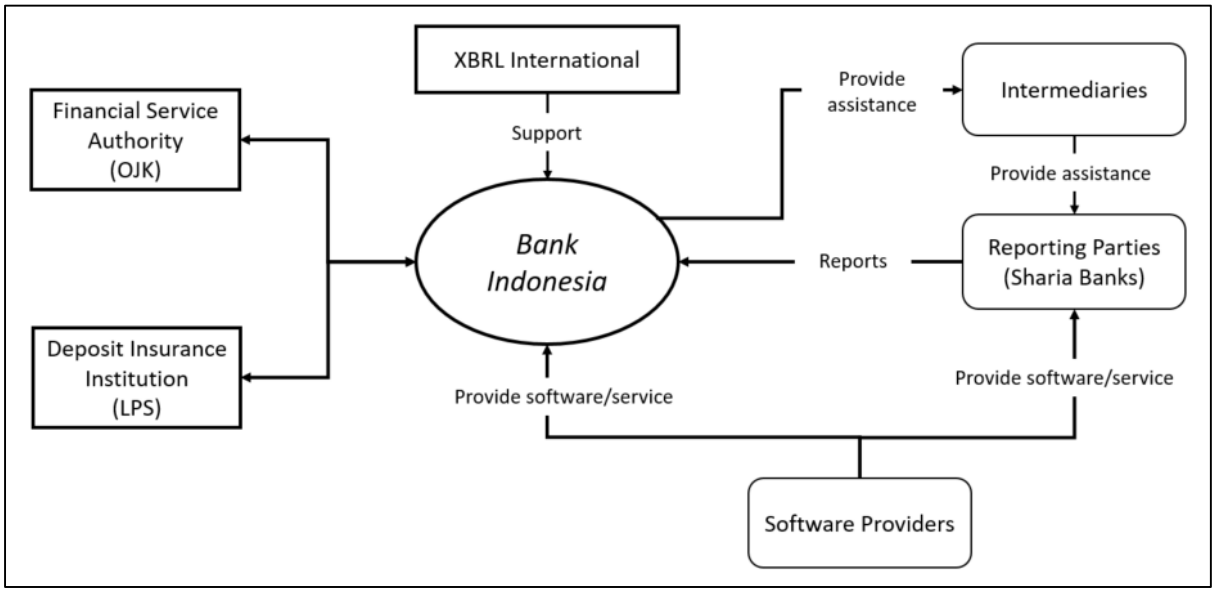


**Figure 4-9 Stakeholders of LBUS (adopted from (Sulastri, 2016, p. 58))**

The Sharia Banks, as the fillers or information providers, have to submit the reports based on the defined requirements. They also have to comply with the legal aspects of reports' submissions. As discussed, they have to invest in developing applications that translate data from their internal system into XBRL format. Software developers take part in the development of the system in BI and Sharia Banks. Last, XBRL international and its community provide continuous support through knowledge sharing and assistance during the implementation process, especially during the XBRL validator and taxonomy development.

In addition, in 2018, there are two additional institutions that, according to Indonesian Law, are entitled to get Sharia banks reports: Indonesian Deposit Insurance Institution (*Lembaga Penjamin Simpanan* or LPS) and the Indonesian Financial Service Authority (*Otoritas Jasa Keuangan* or OJK), Before they developed their own system, BI gave temporary accesses for both institutions to LBUS. LPS is an independent institution that functions to guarantee deposits of banking customers in Indonesia. LPS is a legal entity and is responsible to the President of the Republic of Indonesia. Every bank conducting business activities in the Republic of Indonesia's territory is required to participate in the LPS guarantee. One of the LPS authorities is to obtain data on customer deposits, bank health level data (e.g., risk profile, good corporate governance statement, earnings, and capital level), bank financial statements, and bank inspection reports; those data should violate bank secrecy and data confidential and privacy. Those data are then used to perform tasks in formulating and setting policies in order to actively participate in maintaining the stability of the banking system as well as formulating, establishing, and implementing policies for the settlement of Failed Banks to ensure it does not cause systemic impact and handling of Failed Banks that have a systemic impact.

OJK is an Indonesian government agency that regulates and supervises the financial services sector. The OJK is an autonomous agency that is designed to be free from interference, having functions, duties, and powers to regulate, supervise, inspect, and investigate. The agency was established in 2011 to replace the role of the Capital Market and Financial Institution Supervisory Agency (*Badan Pengawas Pasar Modal dan Lembaga Keuangan* or *Bapepam-LK)* in regulating and supervising the capital market and financial institutions and that of Bank Indonesia in regulating and supervising banks

and protecting consumers of the financial services industry. OJK has three main functions: regulating, supervising, and enforcing the law. There is one department in OJK whose focus is the Bank Supervision, namely the Banking Supervision Department. This department has the tasks of developing systems and regulations for bank supervision; performing coaching, supervision, and bank inspection; providing technical guidance and evaluation in the banking sector, and carrying out law enforcement on regulations in the banking sector.

#### 4.2.3.3 Type of Arrangements

In this section we present the type of information-sharing arrangements used in the implementation of Sharia Banking Reporting System by Indonesian Central Bank. In conducting analysis, we used the analytical lens provided in Figure 4-2 and Table 3-9.

1) The architecture of the information-sharing system

As previously discussed, the banking reporting system in Indonesia has been developed using a fragmented approach. As shown in Figure 4-10, to submit different reports (sometimes with the same data) even to the same agency, information providers have to submit through different applications. Applications are made fragmented due to reporting needs, such as different types of banks (Commercial Banks versus Sharia Banks), reporting periods (daily, monthly, and periodic), and types of data (financial statements, statistics, credits, tax, and others). Therefore, as examples in Figure 4-10, LBU for monthly reports, LBBU for periodically reports, and LHBU for daily reports. The types of reports submitted through these applications may differ, although there might be the same data for these different reports.

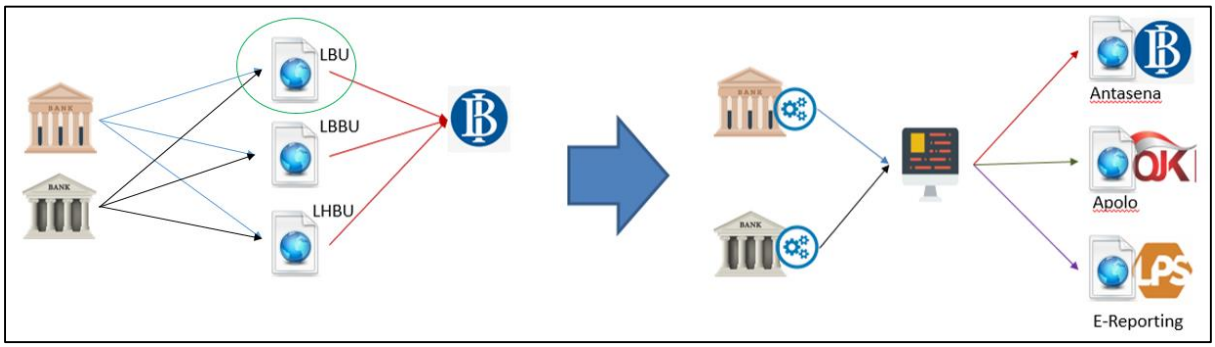


**Figure 4-10 Architecture of Banking Reporting System in Indonesia**

Moreover, LBUS covers monthly reports of Sharia Banks to BI. LBUS can only be accessed during the reporting period. Authorized users can access the application and submit their reports on the day 1st to 5th of the month and then on the day 7th and 8th for revisions (if needed). The reporting mechanism is a push mechanism, the reporter submits the data, and then there is a validation check that is carried out throughout the reporting chain. The first stage of validation is related to data format and data structure, and the second validation is related to business rules to see the suitability of the information. The first validation is done in the LBUS, while the business rules check is done manually by BI. After completing these two validation processes, the fillers will receive approval for submitting the reports.

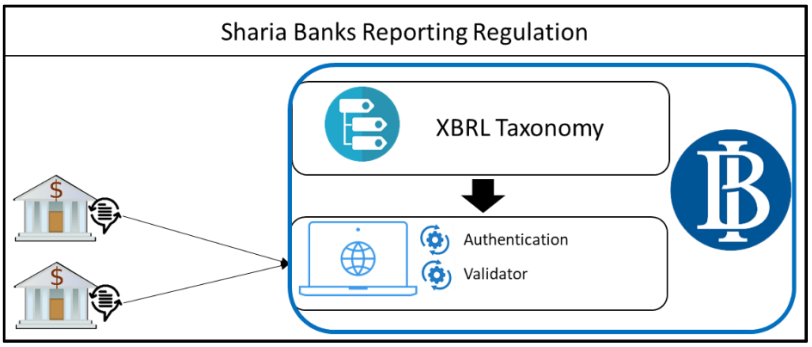


**Figure 4-11 Architecture of LBUS**

Following the framework provided in Chapter 3, LBUS can be categorized as a **centralized** – **dyadic** information-sharing system. The main (web-based) application for report submission has been developed, operated, and maintained by BI, including the development and improvement of taxonomy. Sharia banks can only submit their reports through this application, so it is a centralized approach (Yang et al., 2014). Fillers is responsible for developing a one-on-one interface to LBUS (and other BI reporting applications), which according to (Choudhury, 1997) can be considered as a dyadic information-sharing. The data translation from the internal system into XBRL format should be done before submitting the data through the interface. Interference to the fillers' internal operations, databases, and information systems is not enforced. According to Bekkers (2007), this is an **electronic interface** type of information-sharing system. Furthermore, from the E-Government maturity model, there is no integration, either vertical or horizontal, across government agencies, so the implementation of LBUS can be considered to realize the second level of (Layne & Lee, 2001) model: **transaction**, or first stage of (Klievink & Janssen, 2009) model: **stovepipe**.

2) The governance structure of Banking Reporting System

Similar to other reports for Banking Supervision purposes in Indonesia. LBUS aims to collect periodic reports from Sharia Banks is run based on BI regulation, so reporting through LBUS is **mandatory** for Sharia Banks. According to Indonesian law BI is responsible for maintaining monetary and financial system stability. Bi has the authority to request and collect reports from Banks, including Sharia Banks. Activities include collecting reporting requirements, designing and developing the application to support report submission, and developing the taxonomy. The report validation and approval are directed and orchestrated by BI. These characteristics are part of a typical **hierarchical** structure.

The structure of information-sharing arrangements in LBUS-BI is summarized in Table 4-4.

**Table 4-4 Structure of information-sharing arrangements in LBUS-BI**

| Aspect | Model | LBUS-BI |
|---|---|---|
| System Architecture | Network typology | Gateway |
| | | Dyadic |
| | Data management approach | electronic interface |
| | Level of integration | Transaction |
| | | Stovepipe |
| System Governance | Type of stakeholders | All identified |
| | Decision-making structure | Hierarchical |
| | Information-sharing enablers | Mandatory |

#### 4.2.3.4 Factors Influencing the Banking Supervision Arrangements

In this section, we provide factors influencing LBUS arrangements identified from interviews, using list of factors provided in SLR (Chapter 2). **IT capability** is the first identified factor in influencing LBUS arrangements. Implementation of XBRL is a new thing, no other organization in Indonesia has ever done it. Taking that into consideration, developing IT capability related to XBRL is important. That is why in the earlier implementation phase, most of the efforts were concerning developing IT capability for XBRL for BI and Sharia Banks; including, capability in developing XBRL taxonomy, preparing reports using XBRL data standard, developing proper XBRL tools, or adopting reporting process in a cost-effective manner. It is also important to have an understanding of what is XBRL, what the requirements are, what kind of benefits can be expected from XBRL and the alignment with organizations' needs and strategies for creating public value. Concern regarding IT capability that makes the system architecture built as easy as possible for reporting banks, with web-based applications and bolt-on adoption approaches. The construction of a taxonomy and the creation of a validator tool, which is a relatively more complicated job and requires XBRL capabilities in LBUS, is carried out by BI.

"Successful adoption is highly dependent on readiness, BI and filers" as one of the respondents stated. Therefore, the second factor influencing LBUS arrangements is **organizational readiness** both for the regulators (BI) and the filers (Sharia Banks). One of the steps performed to improve the organizations' readiness was communication. In the initial phase of proposing the use of XBRL in BI, it can take a long time to provide understanding, especially to BI leadership (even internal unit IT leadership), to explain why it is necessary to use XBRL, what are the potential benefits for BI, what kind of supports are needed from BI managements, and especially what risks might be faced in the process of implementation, from development to adoption. Communicating to the filers is also critical to ensure that the requirements are understood, especially by top-level management of the reporting parties. After understanding the needs and requirements, all involved parties then can prepare their organization to implement the XBRL-based reporting system, to prepare from the technological aspect, for example, tools for filing the reports (in-housing or using software by vendors), or from the resource aspect, for example ensuring the necessary skills and knowledge of employees in regards of XBRL itself (data standardization in comparison with other formats), reporting mechanisms, and also, for example, the segregation of duties of the reporting party, which unit has the authorization in data input and which unit has the task of ensuring the quality of the submitted reports (usually by accountants). In addition, in the early phase of the implementation, coaching clinics, trainings, assistance, and workshops were organized frequently by BI.

The next factor identified from this case is the **type of data**. The Banking reporting system is developed to accommodate a variety of reports. Most reports use data that has been processed, while some in the form of raw data, with varied levels of granularity. That is also one of the reasons a stand-alone application is developed for each required report. In addition, the data reported on the LBUS also needs to be reported through other applications using different data standards and formats. Respondents stated that this setting actually raises issues of data integrity and consistency. For example, it was found that similar data that should have been submitted in two different reports were inconsistent after carrying out a data-matching analysis. Consequently, the regulator needs to be carried out additional processes for validation and accuracy. In addition, the unit responsible in

reporting parties may differ depending on the type of report, so there is a possibility that different business rules or data calculations used may cause inconsistency in reported data. But this makes at least the regulators have to cross-check t most raw data to ensure the quality of the data. So that according to the respondents, the benefits of implementing XBRL, for example, the time that is assumed to be effective (more for analysis, input for decision-making, policy evaluations than technical ones, data cleansing, data matching, data verification, etc.) have not really perceived.

**Interoperability** and **system compatibility** is the next identified factors influencing LBUS arrangements. Implementing XBRL in LBUS provides data standardization, format and structure of the reports, and business rules to calculate the data. By this standardization, LBUS and the fillers' applications understand each other on how the report should be prepared and how it should be processed and used. Furthermore, a web-based application is selected to be developed because it provides simpler and easier compatibility between applications. It should be noted that it is critical to ensure the fillers' application is developed according to the specified requirements.

To collect the financial information of Sharia Banks, BI has built an LBUS. The use of XBRL is an initiative of BI. After collecting requirements from internal, type of information and format and structure of the reports, BI issues reporting regulation. In parallel, BI had been preparing and developing an application to support the reporting activities, mainly in-house with the help of a third party for the XBRL taxonomy development. As also discussed earlier, in addition to investment capital in the development of the LBUS, BI also invests in its employees to learn and understand XBRL through workshops and trainings, which are then extended to the reporting parties. BI also maintains and operates LBUS. By this explanation, LBUS is arranged based on **power asymmetry**, with BI as the main actor.

According to the respondents, **perceived costs** are considered to be more critical in the development of LBUS compared to perceived benefits. The main concern from fillers in adopting XBRL is the costs required to build the application to translate their data to the XBRL format and to be in accordance with the defined taxonomy. This results in the development of separated applications by adopting a common reporting mechanism (by common, it means that similar mechanisms are used by BI's applications). BI is responsible for LBUS web-based application, while the fillers are responsible for their translator application. By adopting this bolt-on approach, the cost can be kept to a minimum, especially for the fillers. Although from BI's point of view, the cost savings are not significant and are more for the short-term or only related to application development. More effort is required in processing, cleaning, linking, validating, and comparing with other data or reports, leading to higher costs. In addition, according to the respondents, a typical situation in BI is that a certain team manages different applications. In this case, BI must form a new team to manage LBUS (especially because LBUS is the only XBRL-based application in BI). In other words, this situation causes more human resources and more costs and sometimes requires greater effort in knowledge-sharing so that knowledge about XBRL (and LBUS) is not only owned by the team of people in charge of LBUS.

## 4.3 Case study 2: Implementation of Automatic Exchange of Information (AEOI)

This section presents the second case of this research, which is the implementation of AEOI. This section begins with an introduction to AEOI, followed by an explanation of the AEOI implementation

in the Netherlands and Indonesia. For each implementation, we divided the explanation into four parts, overview of the development of AEOI, stakeholder analysis, type of information-sharing arrangements used in supporting AEOI, and factors influencing information-sharing arrangements.

### 4.3.1 AEOI Standard

AEOI is a standard that supports the information-sharing of taxpayer accounts between countries at a certain time periodically, systematically, and continuously from "the source country" where individuals or groups of individuals have assets, do businesses, or save their wealth with "the home country" of those people. AEOI is developed by the OECD. It requires a mutual agreement to open and provide access to financial information from tax authorities in the source country to the home country's tax authorities and allow the latter to obtain financial information abroad automatically. With this system, taxpayers who have opened accounts in other countries will be able to be tracked directly by the tax authorities of their country of origin. By this, the AEOI standard is intended to be a "tool" in eradicating international tax evasion (Knobel, 2017).

Before AEOI, the exchange of information between countries took place by request and was done sporadically. There was no standardization of what kind of data to be exchanged, in what format, or how the exchange mechanism was. What already existed, and later also becoming a requirement of AEOI, is a bilateral agreement between countries where financial information is needed. For example, when there is an investigation into a tax evasion case or a corruption case in a country that requires information from other countries. This exchange of information is called Exchange Information on Request (EIOR). AEOI does not replace EIOR, but plays a complementary role. Some financial data are being shared automatically and periodically, and some data are shared according to request, especially for data outside the scope required by AEOI.

AEOI has four components: 1) Common Reporting Standard (CRS), 2) The Model Competent Authority Agreement (CAA), 3) the Commentaries of CRS and CAA, and 4) CRS XML Schema (OECD, 2017). CRS "contains the due diligence rules and reporting requirements for the financial institutions to collect and then report the specified information, that underpin the automatic exchange of financial information" (OECD, 2017, p. 7). Model CAA "provides connection between CRS and the legal basis for exchange, specifying the financial information to be exchanged" (OECD, 2017, p. 7). Commentaries to Model CAA and CRS "illustrate and interpret the CRS and the CAA as well as provide additional details of each component" (OECD, 2017, p. 7). Last, CRS XML schema "provides guidance on technical solutions related to data safeguards and confidentiality, transmission, and encryption" (OECD, 2017, p. 8).

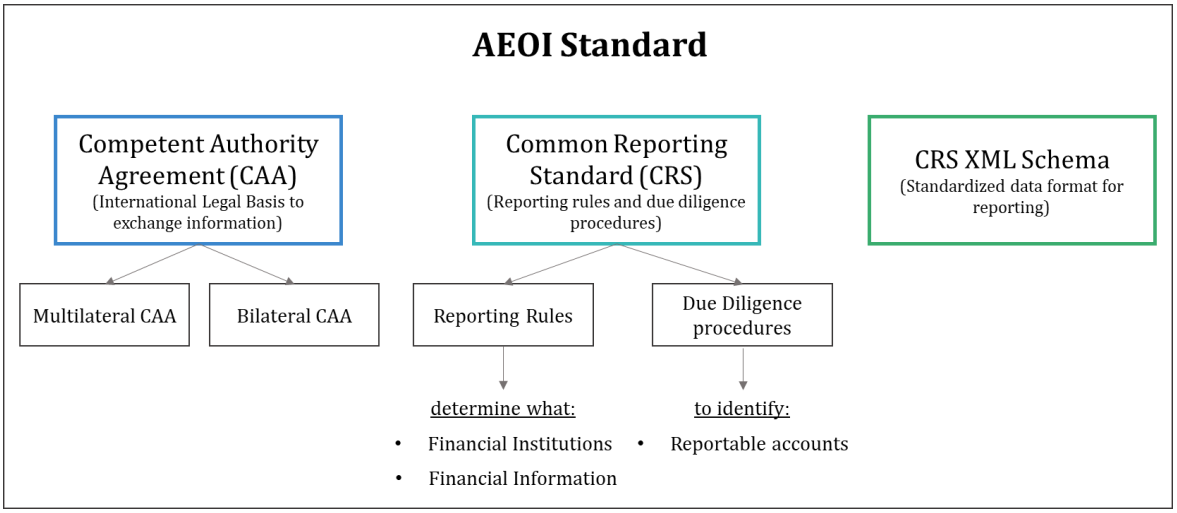


**Figure 4-12 Key Components of AEOI, adopted from (OECD, 2018)**

The AEOI components have to be translated into four main requirements by the participating countries. The first requirement is that the participating country needs to translate the CRS, including reporting requirements and due diligence rules, into their domestic law (OECD, 2018). This requirement addresses two aspects through regulation: first, enforcing the financial institutions to implement the reporting procedures; and second, ensuring consistency of the scope and quality of information for all participating countries. Furthermore, the OECD suggests implementing this CRS translation in three different levels: 1) primary legislation (or umbrella law for the general aspect), 2) secondary legislation, and 3) official guidance or a set of the domestic FAQ (Frequency Asked Questions)[1].

The second requirement, the participating countries must select the international framework that enables the information-sharing with other countries in the form of an agreement. The agreement can be bilateral (country-to-country) or multilateral (within a group of countries) agreements. This requirement may consist of several legal instruments to permit the automatic information-sharing under the specified standard and other separate agreements between the participating countries. This agreement defines the information-sharing mechanism, including what information will be shared, how it is going to be shared, and when the transaction will take place (OECD, 2018).

Third, the participating countries must allocate and develop the required IT system and administrative resources to support information-sharing. According to AEOI standard, this third requirement is divided into three parts: 1) from the financial institutions to the tax office, including collecting and reporting the required information; 2) internal tax office, including receiving, processing, and sending the information to other jurisdictions; 3) inter-jurisdictions, including transmitting and receiving information between two jurisdictions (OECD, 2018). Finally, the participating countries must safeguard and protect the confidentiality of the shared data. For this purpose, the Global Forum, part of the OECD, carried out preliminary confidentiality and data exchange assessments[2].

[1] http://www.oecd.org/ctp/exchange-of-tax-information/automaticexchangeofinformationreport.htm, accessed on 06/02/2018

[2] http://www.oecd.org/tax/transparency/global-forum-launches-a-plan-of-action-for-developing-countries-participation-in-automatic-exchanges-of-financial-account-information.htm, accessed on 06/02/2018

From the technological point of view, the CRS from AEOI standard can be seen as a standardization effort taking place on the data level, including using XML schema and using generic data definition (Casi et al., 2018; McGill et al., 2017; OECD, 2018). Developing the information-sharing infrastructure that enables the CRS reporting is still challenging (Knobel, 2017) due to, for example, different IT maturity, inexperience in dealing with the standard, unawareness about required reporting processes, and the ambiguity of risks, costs, and benefits. Since this research focuses on reporting financial institutions to the Tax Office, the AEOI implementation under study is in the field of business-to-government information-sharing.

In addition, OECD has developed an infrastructure to support AEOI between countries called Common Transmission System (CTS). CTS act as a hub that interconnects reporting system of Tax Administrator in involved countries. Therefore, the Tax Office in transacting countries has to ensure their system is interoperable with the CTS. CTS provides two sharing mechanisms: system-to-system (S2S) and upload-download like a portal facility. Therefore, the Tax Administrator can upload reports via CTS and download information provided by other countries when a notification is received informing there is a report ready to be downloaded. So, the CTS treats the reports based on the destination system. If the reporting and requesting countries have an S2S-ready system, then CTS will send the reports using the S2S mechanism. Only the destination jurisdiction can download the intended files. CRS requires sending and receiving activities to be secured by public-private certificates and element data is encrypted and safeguarded.

However, countries can select not to use CTS as their inter-countries information-sharing. Then those countries need to build their own system, make bilateral agreements with all the partners they want to exchange information with, and build direct links to all the partners. Therefore, those countries need to maintain the agreement and the links, which is resource-intensive. The benefits of AEOI relate to exploring tax potential, checking taxpayers, or as inputs for tax programs.

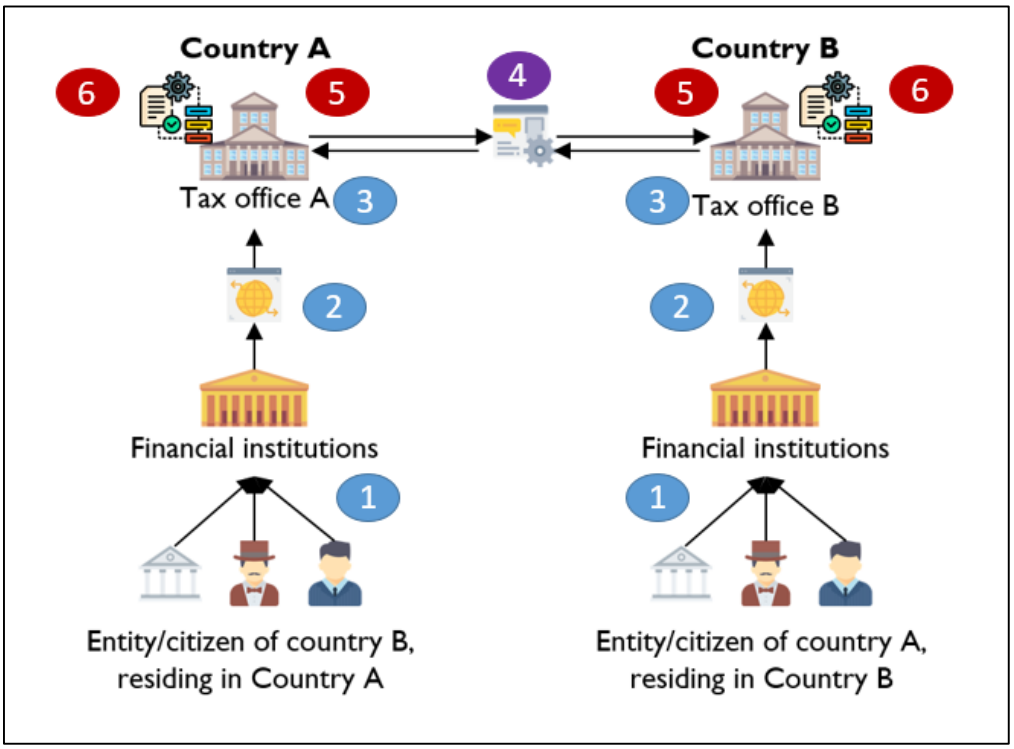


**Figure 4-13 Reporting Processes in AEOI, adopted from (Kurnia, 2019)**

As shown in Figure 4-13, there are six steps of information-sharing in AEOI:

1) Financial institutions in a country which AEOI-enable generate and collect data of foreign (or non-resident) clients.
2) All the collected data is then reported to the Tax Authority through an inter-organizational information-sharing system.
3) Tax Authority is checking and aggregating the data into bulks of data per recipient country.
4) Blk data is encrypted and sent through the cross-country information-sharing system (CTS) to the Tax Authority of respective countries.
5) Bulk data is received by Tax Authority in the recipient countries and then decrypted.
6) The received data are fed into manual or automatic matching process. This process is used to combine the received data from AEOI with existing data, and to prioritize certain taxpayers to be checked.

### 4.3.2 Case 1: AEOI in the Netherlands

#### 4.3.2.1 Development of AEOI in the Netherlands

The implementation of AEOI in the Netherlands started in the year 2014, marked by the signing of the Convention on the Mutual Administrative Assistance in tax matters by the Ministry of Finance and followed by the established FATCA/CRS guidelines. As steps to fulfilling the first AEOI requirement, the Netherlands introduced both Act Implementation Common Reporting Standard and the Common Reporting Standard Identification and Reporting Requirements (Implementation) Decree on 23 December 2015 as primary regulations in AEOI implementation. Then, as a derivative of the main legislations, the Netherlands introduced the Ministerial Order on the Common Reporting Standard on 30 December 2015. In addition, to be able to maximize the objectives of AEOI implementation, the Netherlands amended the International Assistance (Levying of Taxes) Act and Money Laundering and Terrorist Financing (Prevention) Act (Implementation) Decree in 2018 (OECD, 2020).

Furthermore, gradually, the Dutch Government has also fulfilled the second AEOI requirement. The Netherlands is included to the Convention on Mutual Administrative Assistance in Tax Matters and activated the associated CRS Multilateral Competent Authority Agreement in time for exchanges in 2017 based on Directive 2014/107/EU (DAC2). In addition, the Dutch Government also joined the European Union agreements with five European countries and put in place three bilateral agreements with non-European countries (OECD, 2020).

Complying with the third AEOI requirement, in 2016 the Netherlands *Belastingdienst* (Tax Administration) prepared the system to enable the automatic exchange. Accordingly, the financial institutions in the Netherlands need to prepare themselves to provide the required data and to perform the due diligence procedures. Before this, EUTAXUD (European Union of Taxation and Customs Union) developed a system to support the exchange of information among EU member members called CCN. Each EU country has its own CCN gateway. CCN also has a gateway to the outside EU network called SPEED-2 gateway. Accordingly, the system developed by *Belastingdienst* should become interoperable with this system.

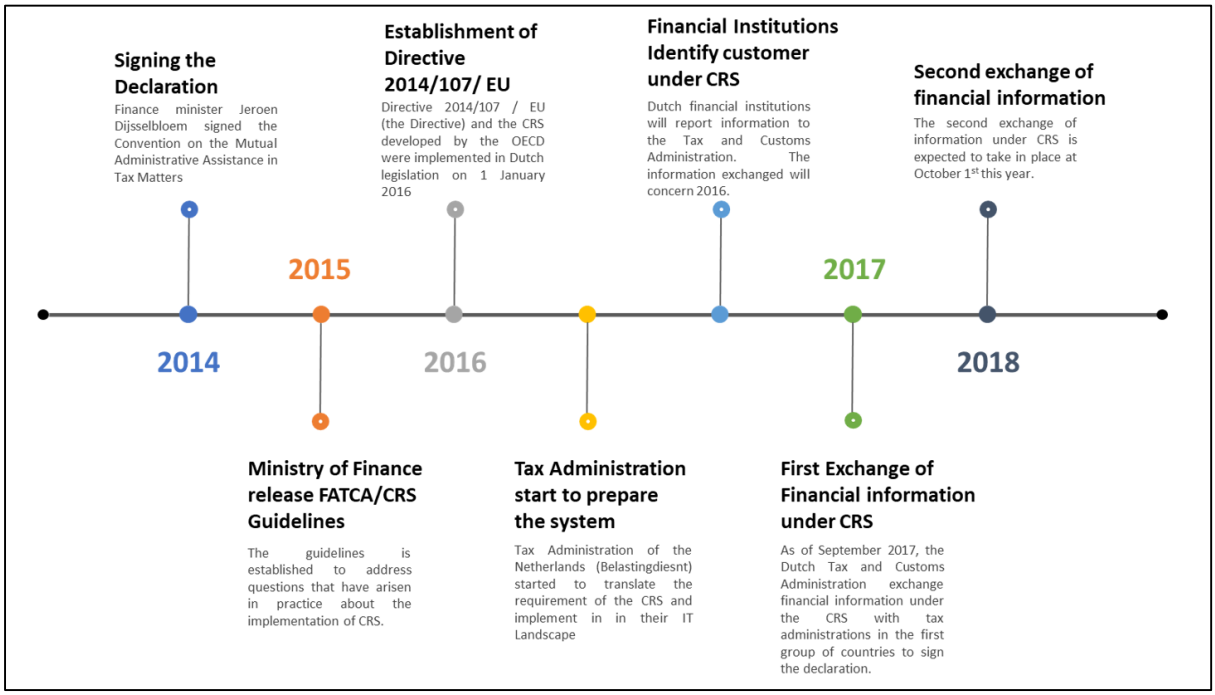


**Figure 4-14 Milestone of AEOI implementation in the Netherlands, adopted from (Kurnia, 2019)**

The Netherlands was being declared as being compliant in 2017 (with an overall rating of *largely compliant* (OECD, 2020)) by the OECD for 10 assessment items: Ownership & identity information, Accounting information, Banking information, Access to information, Rights & safeguards, EOI mechanisms, Network of EOIR mechanisms, Confidentiality, Rights & safeguards, and Quality & timeliness of responses. Then, the Netherlands successfully performed its first exchange of CRS reporting by October 1st, 2017.

#### 4.3.2.2 Stakeholder Analysis

There are several stakeholders involved in the implementation of AEOI in the Netherlands as presented in Figure 4-15. Firstly, in the strategic level, the Ministry of Finance, OECD, and EU TAXUD (European Taxation and Customs Union) are secondary stakeholders that participate in the reporting process.

The interaction between *Belastingdienst* and the secondary stakeholders identified here is mostly related to the regulation or technical interoperability matters for the inter-jurisdiction exchange. The Ministry of Finance has established the act to implement the AEOI/CRS in 2016 in the Netherlands and mandated the *Belastingdienst* as the operational government body to be responsible for enforcing the law. With OECD, *Belastingdienst* is also involved in the development process of the Common Transition System (CTS) that is used to exchange the report between countries. As for the EU-TAXUD, the interaction concern is the use of a network gateway to connect non-EU countries to the member states.

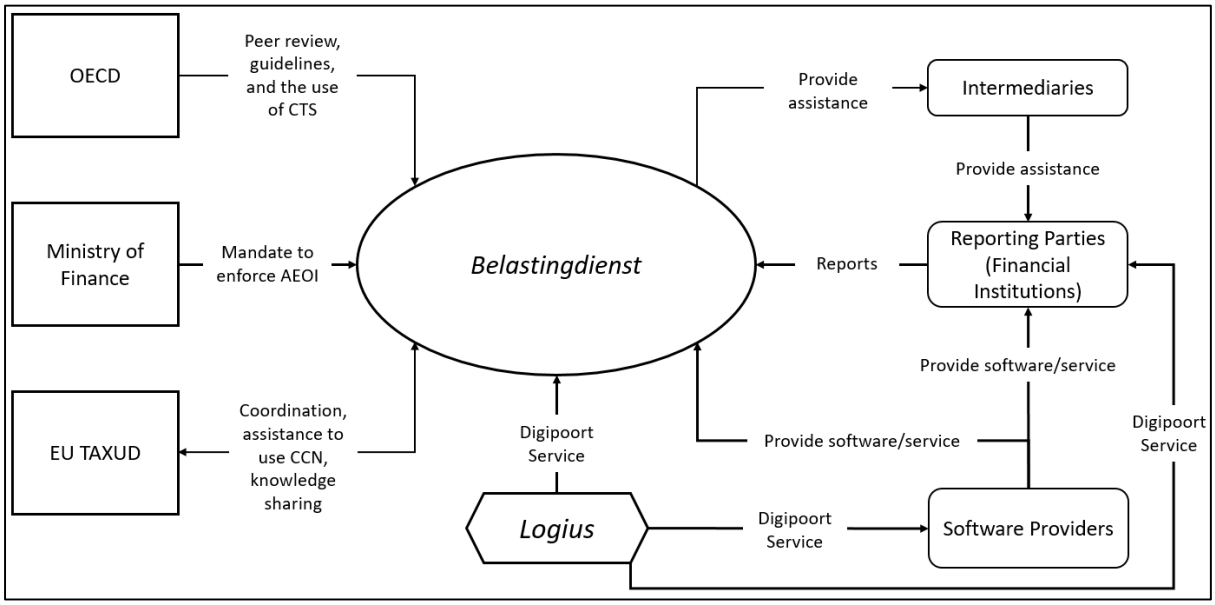


**Figure 4-15 Stakeholders of AEOI in the Netherlands (adopted from (Kurnia, 2019, p. 46))**

Secondly, there are the financial institutions and the auditors at the operational level. The financial institutions have the role as data providers for the reporting. The Auditors, who are secondary stakeholders, ensure that the financial institutions have the eligible capability to provide the correct required data.

Lastly, at the technical level, there are *Logius* and the service providers. *Logius* is responsible for the operational and maintenance of *Digipoort*, the platform used for reporting purposes. *Logius* also provides helpdesk and technical support for the *Digipoort* services to the *Belastingdienst* and the Financial Institutions. The service providers refer to the IT services companies which assist either financial institutions, *Logius*, or *Belastingdienst* and are not constrained to one specific organization.

#### 4.3.2.3 Type of Arrangements

In this section we present the type of information-sharing arrangements used in implementing AEOI in the Netherlands. In conducting the analysis, we used the analytical lens provided in Figure 4-2 and Table 3-9.

1) The architecture of the AEOI in the Netherlands

The implementation of AEOI adds another aspect to B2G information-sharing arrangements in this research due to the situation in which a new standard has to be implemented in an agreed schedule. Therefore the Tax Administration had to find the most suitable arrangements to comply with the AEOI requirements. In the Netherlands, *Belastingdienst* has decided to integrate AOEI into their existing reporting system, using shared infrastructure (*Digipoort*) and adopting some standardized processes (which provided for SBR) previously already established. Figure 4-16 shows the information flow of AEOI in the Netherlands.

Similar to in the SBR case, in terms of system architecture, AEOI in the Netherlands uses a **centralized – multilateral** network typology. *Digipoort*, as a **Government Service Platform** (GSP), is supporting the information flow for AEOI from financial institutions to *Belastingdienst*. *Digipoort*

facilitates information-sharing many-to-many so that for the AEOI, financial institutions only need to make a connection to the GSP through the interface from their system (Yang et al., 2014) and do not need to build a direct connection to each receiving partner (Choudhury, 1997), although for AEOI in the Netherlands the requesting party is only *Belastingdienst*.

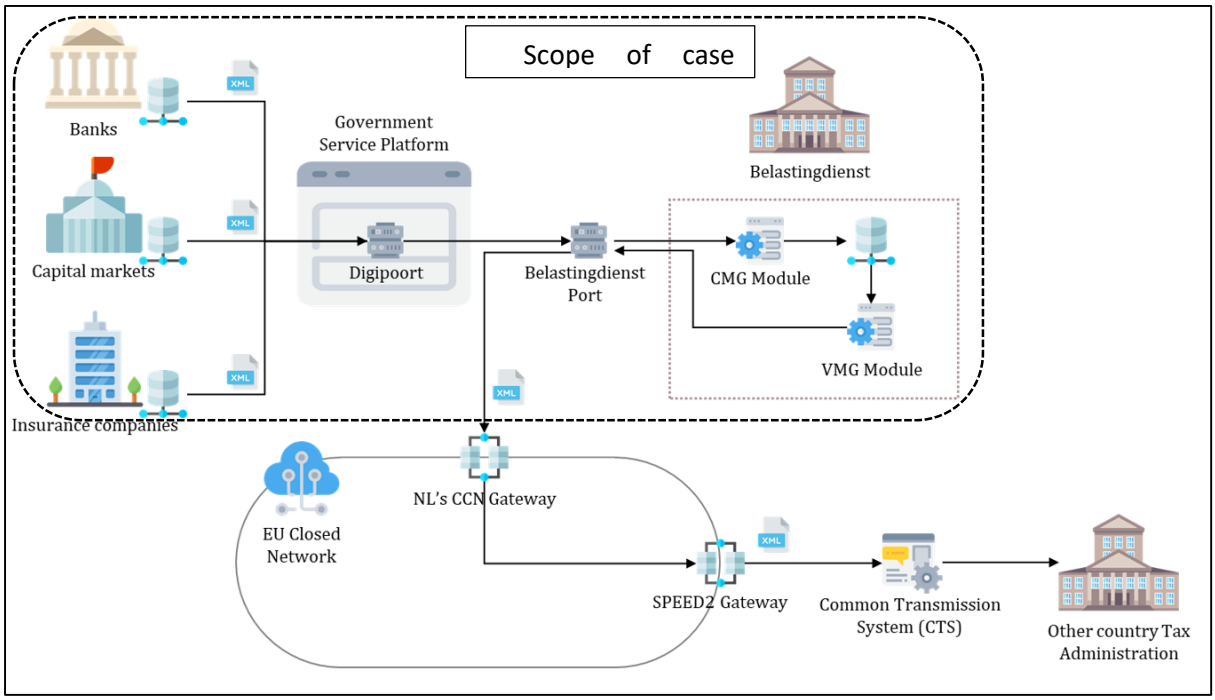


**Figure 4-16 Information flow on AEOI implementation in the Netherlands (adopted from (Kurnia, 2019, p. 49))**

Moreover, in terms of data management, *Digipoort* does not store the report sent from the financial institutions, rather, it only acts as the hub that routes the report to the *Belastingdienst* internal system. Thus, according to (Bekkers, 2007), *Digipoort* can be categorized as the **information broker** type of data management. However, different from SBR, the submitted AEOI data can be integrated directly into the *Belastingdienst* internal systems because it is based on XML. In addition, the financial institutions have to submit the reports only to *Belastingdienst* in AEOI, so although it is used *Digipoort* as the information-sharing system, not all elements are utilized. It does not require horizontal or vertical integration. *Digipoort* is a **national portal** where financial institutions can submit the required data digitally to *Belastingdienst*.

2) The governance structure of the AEOI in the Netherlands

Regarding the governance structure, the identified structure is **hierarchical**. As previously mentioned, despite many stakeholders being involved in the implementation of AEOI in the Netherlands, the main authority for AEOI in the Netherlands is *Belastingdienst*. For the AEOI purpose, no public-private governance was established as *Belastingdienst* orchestrates the whole information chain. However, from the technological aspect, as AEOI utilizes *Digipoort* for its information-sharing system, they need to coordinate with *Logius* as the SSC administrator responsible for the operation and maintenance of *Digipoort*.

The structure of information-sharing arrangements for the implementation of AEOI in the Netherlands is summarized in Table 4-5.

**Table 4-5 Structure of information-sharing arrangements of AEOI in the Netherlands**

| Aspect | Model | AEOI-NL |
|---|---|---|
| System Architecture | Network typology | Government Service Platform |
| | | Multilateral |
| | Data management approach | Information Broker |
| | Level of integration | Transaction |
| | | Nation-wide portal |
| System Governance | Type of stakeholders | All identified |
| | Decision-making structure | Hierarchical |
| | Information-sharing enablers | Mandatory |

#### 4.3.2.4 Factors Influencing the AEOI Arrangements in the Netherlands

As discussed in the previous part, in the Netherlands, AEOI utilizes existing information-sharing system which is used by SBR. It uses a multiport platform owned by the government (*Digipoort*) to implement AEOI requirements stated by OECD. There are several factors identified from this case study as presented in this section.

The **perceived benefits** factor is the first factor identified for AEOI arrangements in the Netherlands. According to a respondent, "For the Netherlands, we tried to stick to the CRS standard, also how to adopt it as easy for us as possible to link up internal system with the CTS (Common Transmission System) … In the Netherlands, basically we already have everything in place, because we already exchanged information with Banks and other financial institutions, and already done that for quite some time, electronically". By this explanation, easy deployment can be considered as a main benefit when *Belastingdienst* decided to use *Digipoort* as the main information-sharing system for AEOI.

The second factor, **perceived cost** is also identified as a factor influencing AEOI arrangements in the Netherlands. One of the respondents mentioned that "talking about the cost, that it is not really balanced with the benefits received, because we don't really know about these insights, at least for now… What we have right now has not yet brought return on the investment. But all the countries don't have a choice, you have to comply with it. It's complex and costs a lot of money… That is why we have to do this as efficiently as possible. Maybe in the coming years, because we have some experience to go, for example, if we get more CRS data, it will help us to get more tax income". This is quite similar to arguments from perceived benefits. The decision to integrate AEOI with *Digipoort* was also driven by the perception that using the existing reporting system would be much more efficient than developing a new system. The perceived cost is a matter of capital investment and in terms of preparation in each organization, including preparing readiness of internal systems and human resources. For the latter, as AEOI utilizes the existing reporting system, few modifications are required in the internal *Belastingdienst* system, even more, due to XML-based data standards used for AEOI. Different to the SBR in which *Belastingdienst* need to provide XBRL to XML translation.

In terms of **organizational readiness**, the involved organizations, especially *Belastingdienst*, have experience reporting financial information inside and within the EU member states. They have been involved in developing the EU reporting system and later in the CTS development with some other

OECD members to support tax reporting. Regarding tax information-sharing, financial institutions (especially those operating in the USA) and *Belastingdienst* have experience with FATCA (USA standard tax information-sharing, which AEOI is based on). So, the AEOI reporting requirements and implementation did not become a big obstacle for both the financial institutions and the *Belastingdienst*.

AEOI is enabled on a voluntary basis, OECD cannot push a country to join the initiative. However, it is bound to international law. Regarding the AEOI, if there is any change in the standards or requirements, there should be discussions, meetings, or lobbies of all member countries, and if they reach an agreement, then the decision can be taken. Only when a country subscribes to the CTS, to use the system, there are rules and policies to be complied with, and then the OECD can enforce these rules and policies. However, it is different within the country's scope, in the context of B2G information-sharing between financial institutions as the reporting parties and Tax Administrator as the requesting party. The first AEOI requirement implies the existence of a hierarchical institutional structure in the implementation of the AEOI. AEOI requirements must be translated into the national laws in each country committed to implementing AEOI; its implementation is under the jurisdiction of the Tax Administrators of those countries. This causes the **asymmetry of power** to become a factor especially influencing the governance structure of AEOI, including in the Netherlands. Usually, the decisions or agreements between countries related to AEOI will immediately be applied to the parties involved in a country. In this situation, the reporting parties may be able to contribute (e.g., providing feedback regarding the need for simplification of reporting or improvement of data quality standards), but the scope is very limited, and it is up to the respective Tax Administrator to deliver their inputs or interests. In addition, in-house development of the AEOI system and integrating the system with the *Digipoort* was done by *Belastingdienst*, with the investment for this development fully covered by *Belastingdienst*.

The next identified factor is **IT capability**. This factor is related to the current IT environment that the Netherlands has. The existing digital reporting system in the Netherlands is considered to be mature and well established. *Digipoort* is the reporting system's service platform with general tooling to standardize processes and provide qualified and integrated system-to-system reporting mechanisms from reporting parties to several public organizations. Furthermore, IT capability of involved parties in the reporting system is also considered high and mature. They were already familiar working with XML and XBRL data in the Java and .Net IT system environments. Leveraging this well-established system and integrating AEOI into the existing reporting system is the most effective and efficient way, even if only in terms of using *Digipoort* and some of its process tools.

**Interoperability** is another technological factor identified influencing the AEOI arrangements in the Netherlands. One of the respondents stated that “the vagueness of the OECD rules and regulations sometimes really a lot of work for us. Because if they say may, should, frequent, recurrent, that’s sort of difficult to interpret the regulations and every country could have their own way to interpret. For example, a country sent a message using certain codes (e.g., Base64), which in our interpretation is not actually allowed, so we said to them, according to rules or regulations, you are not allowed to do it, and they said they thought it is okay. We then need further discussions if it is allowed or not. So we had plenty of difficulties interpreting the rules and regulations. Stronger words would be better in the OECD regulations.” As mentioned in Chapter 3, interoperability can be measured by sub-factors, including standardization and system compatibility. The implementation of AEOI in the Netherlands includes many information-sharing systems. Internally, from financial institutions to the

*Belastingdienst*, reports are submitted through *Digipoort*. Then, *Belastingdienst* sends the data to the receiving countries via the CCN network (if the destination is one of the EU countries) or via CCN - SPEED-2 - CTS (for non-EU CTS destination countries) or via SPEED-2 to non-CTS destination countries. Moreover, one of the respondents stated, "In the EU system, both Java and .Net environments are available and free to use, so the member states can pick at least one of those two environments. The Netherlands build a system on the Java environment benchmarking to the US system with some modifications to make it fit with the Netherlands system's parameters, requirements, and existing IT infrastructure". Regarding standardization, CRS implements XML-based data standards and provides guidelines for the format and structure of the required reports; therefore, this solution has addressed data integration. In addition, as AEOI utilizes *Digipoort*, some processes in *Digipoort* can also be applied, except for data validation since AEOI does not refer to National Taxonomy.

### 4.3.3 Case 2: AEOI in Indonesia

#### 4.3.3.1 Development of AEOI in Indonesia

Indonesia can be considered a late adopter of the AEOI standard. AEOI is perceived by the Indonesian government as a reference and help the authorities increase the tax base, thus increasing state revenue through taxes, and preventing tax avoidance and tax erosion (or Base Erosion Profit shifting) (Pohan et al., 2022). In addition, information collected through AEOI is also used as testing data for Tax Amnesty Program in Indonesia (Natania & Davianti, 2018).

In complying with AEOI requirements, Indonesian government published Law No. 9/2017 concerning Stipulation of Government Regulation in Lieu of Law No. 1 of 2017 concerning the Law on Access to Financial Information for Tax Purposes as the legal umbrella for implementing AEOI in Indonesia. This law explains that access to financial information for tax purposes includes access to receive and obtain information finance in the context of implementing regulatory provisions legislation in the field of taxation and implementation of international treaties in the field of taxation. The law also contains types of reports that fall within the scope of reporting for AEOI, minimum data that must be included in the report, procedures for identifying financial accounts, reporting mechanisms, the due date of the reporting period, and a penalty system for non-compliance.

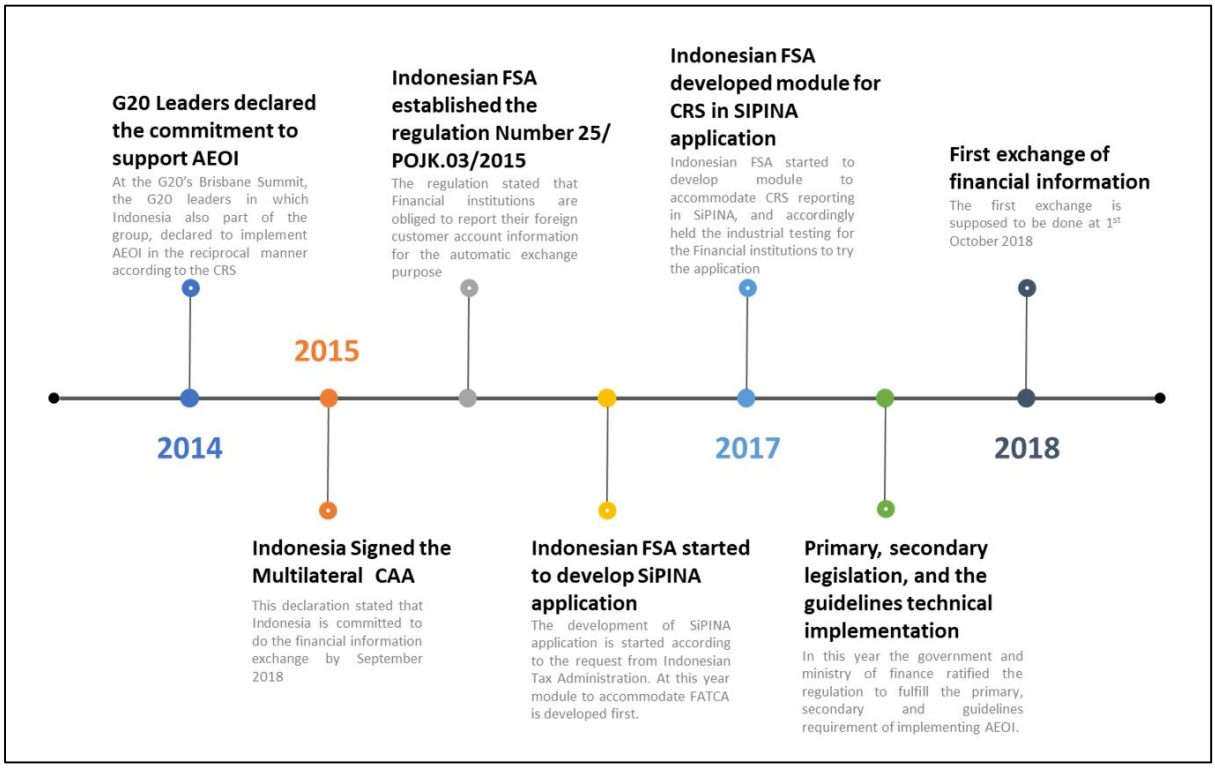


**Figure 4-17 Milestone of AEOI implementation in Indonesia (taken from (Kurnia, 2019, p. 55))**

This law is then supplemented with several technical regulations as its derivatives, including:

1) Regulation of the Minister of Finance Number 73/PMK.03/2017 concerning amendments to Regulation of the Minister of Finance Number 70/PMK.03/2017 concerning Technical Guidelines regarding Access to Financial Information for Tax Purposes;
2) Regulation of the Minister of Finance Number 39/PMK.03/2017 concerning Procedures for Exchange of Information based on International Agreements;
3) Regulation of the Director-General of Taxes Number PER-04/PJ/2018 concerning Procedures for Registration for Financial Institutions and Submission of Reports containing Financial Information automatically;
4) Financial Services Authority Regulation Number 25/POJK.03/2015 concerning Submission of Tax-related Foreign Customer Information to Partner Countries or Partner Jurisdictions; and
5) Financial Services Authority Circular Letter Number 16/SEOJK.03/2017 concerning Submission of Tax-Related Foreign Customer Information in the context of Automatic Exchange of Information Between Countries using Reporting Standards (Common Reporting Standard).

Based on all of these regulations, there are two main authorities of AEOI in Indonesia: first, the Indonesian Tax Administrator (called *Direktorat Jenderal Pajak* or DJP), and second, the Indonesian Financial Services Authority (called *Otoritas Jasa Keuangan* or OJK)

Next, the implementation in the Information-sharing infrastructure is executed in 2017, and the first exchange took place in 2018. Considering the existing reporting system in Indonesia, especially tax and other financial reporting systems to DJP and FSA, both authorities decide to develop a new application to support AEOI, *SIPINA*. The *SIPINA* application is a web-based application developed as the main reporting gate from financial institutions to OJK and DJP. SIPINA accommodates two data formats for the AEOI reporting, XML format (as required for AEOI) and MS Excel format. There are two

reasons for this arrangement: first, not all financial institutions are familiar with XML-based reports, and second, to support EOI reports mainly done using MS Excel format. Because of this arrangement, there are also two types of validating mechanisms. For the XML format, there is a validation module inside the application that checks the XML structure format and the business rules of the data, therefore, the validation is done by the system. On the other hand, the validation of the MS Excel format should be done by the financial institutions prior to uploading the data. Reports and data received by both authorities (depending on the type of financial institutions) from the SiPINA application will be available to be downloaded by the authorized person in DJP and OJK. The data from the SiPINA is already encrypted, and thus to decrypt, the authorized person will receive the public key from the personnel either from DJP or OJK. The authorized personnel from DJP or OJK will then check the downloaded data from the SiPINA, aggregate the data based on the country's residence (destination), and then send the data through the CTS.

In the 14th AEOI Working Group Meeting (in 2018), the results of the follow-up assessment on confidentiality and data safeguards for Indonesia were officially announced and concluded that Indonesia is ready to exchange information reciprocally through AEOI. However, the impact and benefits for the society in Indonesia are still practically unclear. As for now, there are at least four issues faced by DJP and OJK in processing AEOI data collected from other countries. First, the data does not include the Taxpayer Identification Number (in Indonesia called *Nomor Pokok Wajib Pajak* or NPWP), which is essential so that DJP can compare received data (data matching) with the individual tax reports. Second, the addresses of the owner of the financial asset are mostly incomplete or located abroad, so the authorities have difficulty following up. Third, the authorities did not find information on the name and date of birth of the financial account holder, so tracking through the Population Identification Number (in Indonesia called *Nomor Induk Kependudukan* or NIK) would also be difficult. Fourth, the AEOI data only includes financial data and does not include property data and crypto-asset investments; the latter is currently being discussed as it is considered an escape route for tax evaders.

#### 4.3.3.2 Stakeholder Analysis

As shown in Figure 4-18, there are seven stakeholders involved in the implementation of AEOI in Indonesia. The main stakeholders in the implementation in Indonesia are the Indonesian Tax Administrator (DJP) and the Indonesian Financial Service Authority (OJK). Furthermore, at the strategic level, the Ministry of Finance and the OECD are the program initiator. In this case, the Ministry of Finance is the highest hierarchy that gives a mandate to both DJP and OJK to implement the AEOI and CRS reporting standard. OECD assist and help DJP and OJK in AEOI implementation and also provide peer-review assessment to ensure all requirements have been addressed, including the National Laws, information-sharing system, and mechanism to ensure confidentiality and safeguarding data. As for the primary stakeholder, DJP and OJK, the interaction occurs during the development of *SIPINA* application and through the workshop regarding CRS and *SIPINA* applications for the financial institutions.

At the operational level, the financial institutions under the FSA, need to submit their report to the OJK through *SIPINA*. While financial institutions outside the supervision of OJK can directly submit their report to DJP. The division of the financial institutions' supervision is regulated under the Ministry of Finance decree.

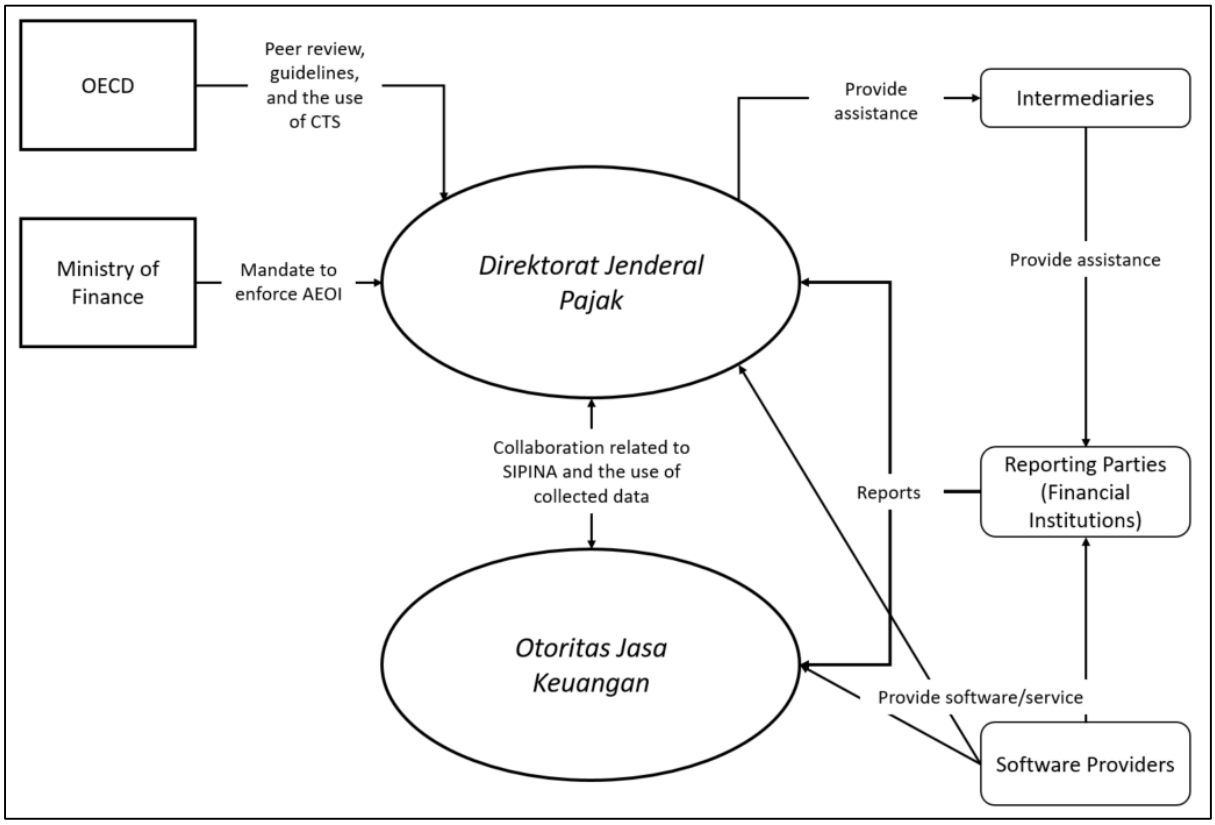


**Figure 4-18 Stakeholders of AEOI in Indonesia (taken from (Kurnia, 2019, p. 58))**

Lastly, the technical level is related to the development of *SIPINA* application. DJP and OJK have been collaborating to develop the web-based application and provide the requirements to be fulfilled and the type of data format in place. The *SIPINA* application was developed by OJK by employing a third party. The application owner of *SIPINA* is the Business Department of OJK. The first phase of the system development is the creation of user requirements. This is based on a coordination meeting between OJK and DJP. In this meeting, they produced the user requirements for the *SIPINA* application. Then, the user requirements were translated by the IT Department of OJK into the User System Specification. This User System Specification then became the basis for the software provider appointed based on the tender to build *SIPINA*. In addition, both the DJP, as the Indonesian government's representation to the OECD regarding AEOI, and the OJK, as the owner of the application, are responsible to make decision should there be any changes required for the data formats or other functionalities.

#### 4.3.3.3 Type of Arrangements

As discussed in the previous section, AEOI in Indonesia was implemented using a Greenfield approach, or building the system from scratch. This is due to the absence of an adequate existing system for the implementation of AEOI in accordance with the requirements determined by the OECD. In this section we present the type of information-sharing arrangements used in the implementation of AEOI in Indonesia. In conducting the analysis, we used the analytical lens provided in Table 3-9 and Figure 4-2.

1) The architecture of the AEOI in Indonesia

In the Indonesian case, the identified network typology is the **semi-centralized – hybrid** type. Semi-centralized type is done through an **electronic gateway** designed to transact and verify (Yang et al., 2014). **Hybrid** ISSs is defined as the ISSs form that could interconnect partners with different structural linkages preferences. There are partners that implement the dyadic and multilateral linkages (de Corbière & Rowe, 2010).

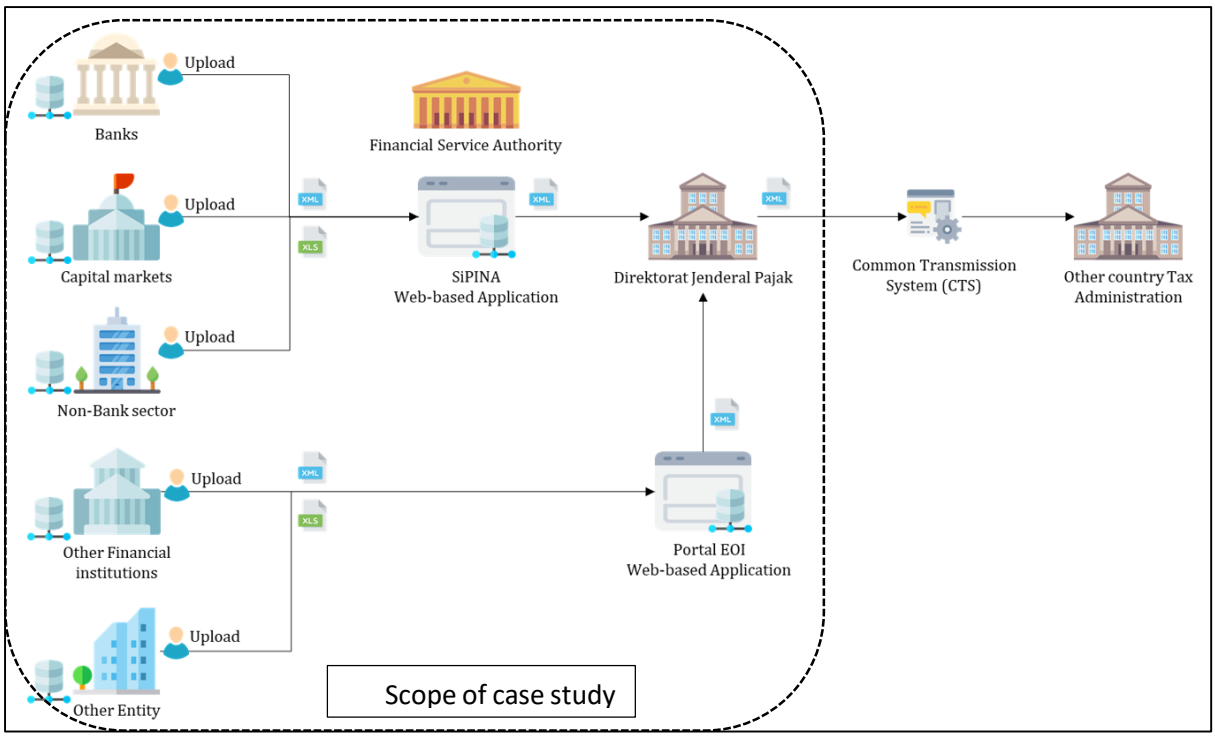


**Figure 4-19 Information Flow Diagram of AEOI in Indonesia (taken from (Kurnia, 2019, p. 61))**

Indonesia uses a web-based system that resembles a gateway in facilitating financial institutions' reporting to DJP and OJK. The existence of two destinations resembles a hybrid ISS type of interconnection because, though the financial institutions need to report to OJK through the *SIPINA* application, financial institutions still need to report directly and to the DJP for some reports. In this sense, there is no single window that becomes the central ISS facilitating the many-to-many connection between the information providers and receivers. Thus, it cannot be said as a multilateral ISS.

In terms of data management, *SIPINA* application stores the reports, and thus it can be seen as the centralized database type according to the categorization proposed by (Bekkers, 2007). For the level of integration, using the web-portal, financial institutions as the reporting parties are able to submit the required reports to the requesting parties, while integration between DJP system and OJK system has not been fully implemented (one window with silos back-office systems), so this included in the **transaction** level.

2) The governance structure of the AEOI in Indonesia

Similar to the Netherlands, as part of AEOI requirements, the implementation of AEO must be translated into the National Laws. Hence, information-sharing is mandated. In the Indonesian case,

due to institutional structure, there are two authorities for AEOI, OJK and DJP. DJP also plays a role as the Indonesian government's representative regarding AEOI in the OECD. The decisions regarding standards or CTS (system to support cross-country information-sharing) are based on agreement among OECD members. Within the country's scope, both DJP and OJK are responsible for implementing AEOI, ensuring requirements are met, providing a system to support, and reporting activities from financial institutions running well. This can still be considered as a hierarchical governance structure, in which DJP, with the help of OJK, dictates the whole arrangement, while the reporting parties have limited contribution or involvement regarding the decision or implementation of AEOI.

The structure of information-sharing arrangements for the implementation of AEOI in Indonesia is summarized in Table 4-6.

**Table 4-6 Structure of information-sharing arrangements of AEOI in Indonesia**

| Aspect | Model | AEOI-INA |
|---|---|---|
| System Architecture | Network typology | Gateway |
| | | Hybrid |
| | Data management approach | centralized database |
| | Level of integration | transaction |
| | | integrated governments |
| System Governance | Type of stakeholders | all identified |
| | Decision-making structure | Hierarchical |
| | Information-sharing enablers | Mandatory |

#### 4.3.3.4 Factor Influencing AEOI Arrangements in Indonesia

As discussed in the previous part, in Indonesia, AEOI is implemented by developing a new application. It aims to provide simplicity and ease to use for the users to report their data using the application. The system has also provided a feature to report the data using "MS Excel" format. There are several factors identified in influencing the AEOI arrangements as follows:

The **perceived benefits** factor is the first identified factor. Indonesia previously did not have an established information system that could accommodate the reporting of AEOI. It led to the initiative to develop a new system so that the financial institutions could submit the reports. The web application is preferred as it is ease to use and has a shorter development time. By choosing to develop a new web-based system, the required functionalities can be easily fulfilled because there is no need to consider whether the new functionalities may create problems with the existing legacy system. In addition, developing web applications is relatively easy compared to other programming language-based systems, technologically quite stable, and many people can develop, operate, and maintain.

Align with prior arguments, **the perceived** cost of implementing a web application is also less expensive than developing an integrated system. With this, the scope of authority between DJP and OJK can also be separated in accordance with regulations, therefore, the investment can also be divided between these two agencies. From the reporting side, the cost of implementing AEOI can also be minimized. Because of the arrangement made by OJK and DJP, AEOI reporting can be considered like any other ongoing financial reporting to DJP or OJK. There is no need to change or modify the internal system nor the necessity to translate their data into XML format because the application

provided to support AEOI can also accept excel format. However, there should be additional efforts to prepare the required data and ensure the quality of reported data, in terms of accuracy, completeness, and validity.

Furthermore, the organizational factor identified as influencing the implementation of AEOI in Indonesia is **organizational readiness**. As a new standard, AEOI has never been experienced by organizations in Indonesia (either DJP, OJK, or financial institutions), including the need for XML-based data standards. Thus, meeting the required data on the side of financial institutions and enforcement as well as creating awareness of reporting on the side of the DJP and OJK can be quite a difficult challenge. In this regard, DJP and OJK have been collaborating by providing workshops on the AEOI and CRS. In addition, both institutions provide a helpdesk that can be used by financial institutions and intermediaries (who are interested in helping report on the side of financial institutions, e.g., software providers, accountants, or consultants) to solve any issues related to reporting mechanisms through *SIPINA*.

From the technological factors, lack of **IT capability** regarding XML data format in internal DJP and OJK, as well as a prior reporting mechanism, which is mostly done using different types of data format and standards, are influencing the decision to provide the reporting based on XML and excel format. With these 2 options, reporting parties can choose and adapt to their internal system. For example, small-sized financial firms with limited technology expertise (or resource in general) can easily provide the required data and reports using excel without changing their data into XML.

Next, the use of the web-application (*SIPINA*), which provides two kinds of upload mechanisms for financial institutions, the XML and excel file uploads, aims to facilitate the **interoperability** and **compatibility** of the reporting. Web-based application provides system compatibility since it is compatible with almost all platform. Processes to access the application (through user authentication and authorization), declare the submission, and submit the reports are standardized. However, the provision of data format options in the reporting system can cause data interoperability problems. In this case, DJP, as the party that will send data to the tax authorities in other countries, is responsible for combining data from the two formats and ensuring the shared data complies with AEOI requirements. In other words, this arrangement has additional work on the side of the DJP.

The institutional structure and **power** also have an influence on the AEOI arrangements in Indonesia. In Indonesia, since both DJP and OJK have the authority to supervise the financial institutions, there may be confusion about who has more power in making decisions. Based on Indonesian laws, the supervision scope of OJK is bigger than DJP, so OJK is becoming part of the reporting chain as the first pooling of data from financial institutions before it is forwarded to DJP. However, some financial institutions that, by law, are not under OJK supervision and are within AEOI scope. Therefore, these financial institutions must submit their data or reports directly to the DJP. From AEOI requirements, DJP is the main stakeholder in AEOI implementation. Again, this situation creates a dispute over power. The reporting parties can only follow the direction provided by the government and have no say in influencing the decisions made.

Last, different from the Netherlands' case, we identified time and external pressure as one of the factors influencing AEOI implementation in Indonesia. Indonesia's government was committed to a certain date as the deadline to participate in the AEOI (1$^{st}$ of October 2018) that drives the selection of web-application system, as it is relatively faster and easy to develop and already familiar to the many organizations which require to be involved in AEOI.

## 4.4 Conclusions from Qualitative Analysis

By investigating information-sharing system architecture and information-sharing governance perspectives, the four cases presented in this chapter show that B2G information-sharing can be arranged in various ways. From the system architecture perspective, information-sharing can be arranged differently based on the network typology, data management approach, and level of integration. From the governance structure perspective, the cases show that information-sharing can be characterized by whether it is obligated or not, the type of decision-making structure used, agreement among participants, and the type of stakeholders involved in the information-sharing.

The common thread of the two cases investigated in the XBRL-based reporting system, SBR in the Netherlands and Sharia Banking Reporting System (LBUS) in Indonesia, is the adoption of XBRL as a data standard. SBR aims to go big, to become an integrated national-wide reporting system. On the other hand, the implementations of XBRL-based reporting system in Indonesia are conducted independently by different institutions based on their area of authority. Among these are the Central Bank of Indonesia (*Bank Indonesia* or BI), the Financial Service Authority of Indonesia (*Otoritas Jasa Keuangan* or OJK), and the Indonesia Stock Exchange (IDX). The first XBRL-based implementation in Indonesia, LBUS can be considered as proof-of-concept for implementing XBRL, to understand how it works, the benefits, and potential challenges.

In the end, the results obtained are in accordance with these targets and objectives. At SBR, XBRL is only one puzzle that completes the big picture of the reporting system architecture. Developed to be used across domains, the opportunities are vast. Meanwhile, for the Indonesian case, XBRL was considered as being successfully adopted by Sharia Banks. However, due to the limited scope, the XBRL ecosystem is not well-developed. Not many software providers provide XBRL-based reporting tools, and as a consequence, the XBRL tools are expensive. And the experts who understand XBRL are few in numbers.

From the AEOI implementation, the guidelines provided by the OECD are detailed and strict, resulting in less flexibility in the arrangements. Starting from the analysis of the existing information-sharing system, the Netherlands then chose to integrate AEOI with the existing integrated reporting system, while Indonesia chose to develop new applications independently from the existing reporting system. AEOI in the Netherlands is enabled using the existing Government Service Platform (GSP), using *Digipoort* with i-process and process engine. As AEOI is an XML-based data standard, the Dutch taxonomy of the SBR is not used. The governance structure for AEOI implementation in the Netherlands combines requirements from OECD, with the governance structure of the GSP, which includes many influencing stakeholders, especially the SSC Administrator (*Logius*).

Indonesia took another approach to implementing AEOI. In Indonesia, two government agencies are involved in AEOI, Tax Administration and Financial Service Authority (FSA). Involvement of FSA in AEOI is because according to Indonesia's law. FSA has the authority to supervise the financial institutions. Therefore the data should be reported to and approved by the FSA as well as to the Tax Administration. Due to this institutional structure, two separate applications are used in Indonesia: *SIPINA* application by the FSA and Portal EOI by the Tax Administration. Both applications are separated from other reporting systems in FSA or Tax Administration, and both are newly developed only for AEOI.

**Table 4-7 Factors Influencing B2G information-sharing identified from Case Studies**

| No | Factor | SBR | BI | AEOI NL | AEOI INA |
|---|---|---|---|---|---|
| 1 | Perceived Benefits | ✓ | | ✓ | ✓ |
| 2 | Perceived Costs | | ✓ | ✓ | ✓ |
| 3 | Perceived Risks | | | | |
| 4 | Organizational Readiness | | ✓ | ✓ | ✓ |
| 5 | Organizational Compatibility | | | | |
| 6 | Organizational Culture | ✓ | | | |
| 7 | Organizational structure | | | | |
| 8 | Trust | ✓ | | | |
| 9 | Power Asymmetry | ✓ | ✓ | ✓ | ✓ |
| 10 | Pressure | | | | ✓ |
| 11 | Inter-organizational Relationships | ✓ | | | |
| 12 | Diversity of Actors | ✓ | | | |
| 13 | System Quality | ✓ | | | |
| 14 | System Security | ✓ | | ✓ | ✓ |
| 15 | Interoperability | | ✓ | ✓ | ✓ |
| 16 | Technical Compatibility | ✓ | ✓ | ✓ | ✓ |
| 17 | IT Capability | | ✓ | ✓ | ✓ |
| 18 | Availability of Technical Support | ✓ | | | |
| 19 | Type of Data | | ✓ | | |

As presented in Table 4-7, many factors were found in the cases that influence information-sharing arrangements, ranging from organizational and technological factors, to inter-organizational factors. These factors were identified during the development process, starting from the exploration, implementation, and exploitation of information-sharing systems; only a few previous studies investigate this entire processes (e.g., Efendi et al. (2011); Karlsson et al. (2017)). In addition, although this study investigated multiple cases within the financial reporting domain, the factors identified in each case varied. Some factors were identified in multiple cases, but there are also factors that are only identified in a single case, and there are also factors from the literature that are not found in any of the cases investigated.

This variation suggests that if we conduct research with more cases, we could find other factors that influence B2G information-sharing arrangements that were not identified in this study. This is especially if the cases provide different contexts (for example, real-time information-sharing), domains (for example, in supply chains, cyber-security, or health cases), or locations. This can also be considered as a limitation of this study, particularly in qualitative analysis, as we only investigated multiple cases in one domain.

The summary of the factors from cases presented in Table 4-7 also shows that technological factors such as IT capability, system security, technical compatibility, and interoperability are considered important in most of the investigated cases. Apart from that, perceived benefits, perceived costs, and power asymmetry can also be considered as important factors in influencing B2G information-sharing arrangements.

# 5. Model of Factors Influencing B2G Information-sharing Arrangements

In the previous chapters, we present the results of the case study. Four cases in the implementation of B2G information-sharing were analyzed to show how B2G information sharing is arranged and the factors influencing the arrangements. This chapter provides a quantitative analysis of the factors influencing information-sharing arrangements. Data were collected using a survey and analyzed to provide empirical evidence from a broader sample, focused on identifying factors explaining information-sharing arrangements. As shown in Figure 5-1, this chapter aims to answer RQ3 and RQ4: which factors influence B2G information-sharing arrangements and which factors (or combination of factors) influence elements of information-sharing arrangements? The answers were obtained by testing the significance of the factors and gaining insight into the magnitude of the factors influencing information-sharing arrangements in a proposed model.

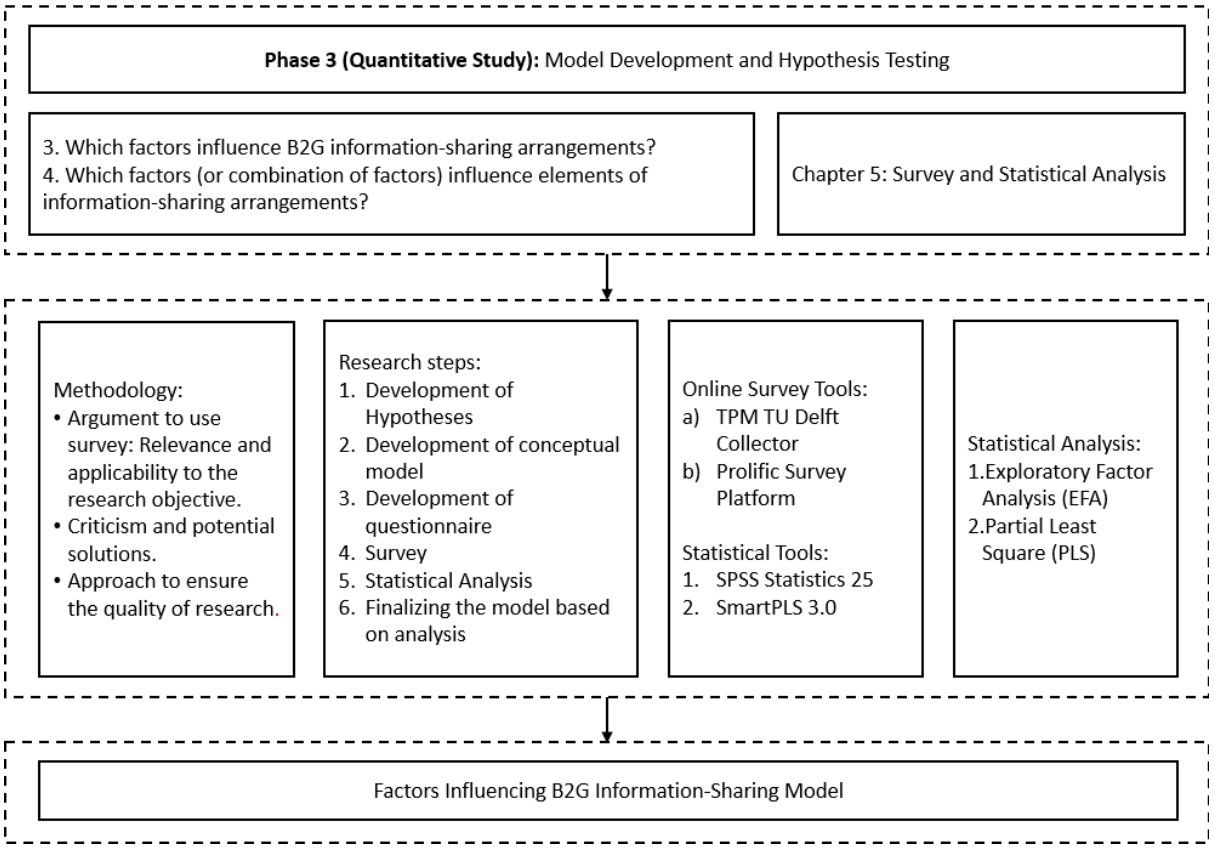


**Figure 5-1 Framework of the quantitative part of this study**

This chapter begins by presenting the hypothesis development. Each variable used to build the model is described in section 5.1. It starts with variables describing the information-sharing arrangements followed by factor variables. In this part, we also present the operationalization of each of the variables via questions asked during the survey. Then, based on the literature and findings from

previous chapters, the relationships between factors and information-sharing arrangements are stated in the form of a hypothesis.

Following that, we present a survey used to test all of the hypotheses. In 5.2, we present the demography of the respondents. We then present the descriptive analysis in 5.3. In 5.4, we provide the results of the statistical analysis of data collected from the respondents. The statistical analysis was done in two stages. The first stage is Exploratory Factor Analysis (EFA) to test the measurement indicators of each variable. The second stage, Partial Least Square (PLS), is used for hypothesis and model testing. We then discuss those results in 5.5, and finally, in the last part, we present the conclusions.

# 5.1 Model Development

Chapter 3 provided a list of factors that could impact inter-organizational information-sharing, either hindering or facilitating. Nevertheless, those factors give less insight into information-sharing arrangements. We then discussed the construct of the information-sharing arrangements using the architecture and governance structure of information-sharing. The factors and types of arrangements are aggregated into a model that is tested in this chapter. However, because it is impractical to test all of the factors, we aim to build a parsimonious model. This would enable us to explain information-sharing arrangements using a limited, yet significant, number of factors.

In this section, we describe the hypotheses that relate factors and the types of B2G information-sharing arrangements. In total, we developed 24 hypotheses supposing a causal relationship between the "factor" variables (as the exogenous constructs) and the "information-sharing arrangements" variables (as the endogenous constructs). In Structural Equation Modeling (SEM), exogenous constructs refer to "*constructs that affect the values of other constructs in the model*" (Hoyle, 1995, p. 19). Endogenous constructs deal with "constructs that are influenced directly or indirectly by exogenous constructs" (Hoyle, 1995, p. 19). Bhattacherjee (2021) explains that "*constructs are abstract concepts in research that are specifically chosen or created to explain the phenomenon to be studied… while the variable is a measurable representation of the construct*" (p.20). "*As an abstract entity, the construct cannot be measured directly. Therefore, it takes a proxy measure called a variable*" (Bhattacherjee, 2021, p. 21). Accordingly, variables are created by translating the constructs into a measurable form.

Following the previous steps, we also grouped factors into organizational, inter-organizational, and technological factors to clarify differences between factors and to facilitate the interpretation of the analysis results. The hypotheses were also developed under the assumption that some factors may explain several types of arrangements, while others may only explain one type of arrangement. Furthermore, there may also be structural paths among factors, for example, between privacy and security concerns and perceived cost. Or between power asymmetry to the level of distrust among participants in information-sharing. For this type of relationship, we developed four additional hypotheses explaining the relationship between factor variables.

Explanations of each construct and variable are presented in the next section. We started by explaining five variables of "information-sharing arrangements", followed by twelve variables of "factors that influence information-sharing arrangements".

### 5.1.1 Endogenous Constructs: Information-sharing Arrangements

One of the key elements of this study is constructing information-sharing arrangements. From the literature review and the case study, there are many ways to start an information-sharing arrangement and how such an arrangement can evolve over time. This study does not attempt to provide a complete view of information-sharing arrangements but to explain that certain factors determine various information-sharing arrangements.

As presented in Chapter 2, information-sharing arrangements are characterized by information-sharing systems architecture and governance of information-sharing. So, the endogenous constructs should represent both dimensions. For this quantitative study, we used five variables derived from the literature and the case studies (as shown and selected from Table 3-9), allowing us to distinguish different information-sharing arrangements. These variables are 1) the need for a legal framework, 2) the establishment of agreements between involved actors, 3) the decision-making structure regarding information-sharing, 4) the typology of infrastructure used to share information, and 5) the level of technical standardization. The typology of systems and the level of technical standardization were used to represent the architectural part of information-sharing arrangements, while the need for a legal framework, the establishment of agreements, and the decision-making structure were used to represent information-sharing governance.

Next, we created a framework to operationalize each variable. A low level of standardization and the use of dyadic typology is consistent with a fragmented information-sharing system. In contrast, a higher level of technical standardization and implementation of multilateral typology should explain an integrated information-sharing system. On the governance part, we argue that mandating information-sharing, establishing contractual agreements, and less participatory decision-making represent hierarchical governance, while voluntary information-sharing, establishing relational agreements, and more participatory decision-making represent network governance. Figure 5-2 shows the framework of information-sharing arrangements used in this quantitative study. Appendix C presents measurement indicators for all endogenous constructs.

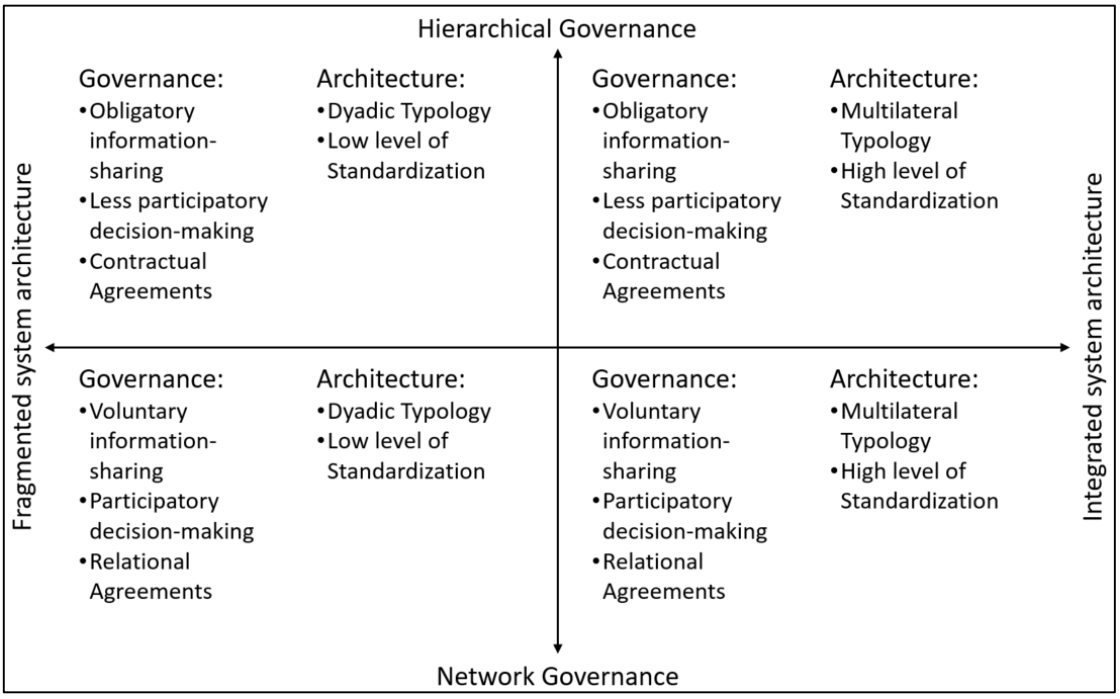


**Figure 5-2 Framework of the information-sharing arrangements construct**

#### 5.1.1.1 Regulatory Framework (REFA)

The first variable of information-sharing arrangements is whether it is obligatory (mandated by law) or voluntarily information-sharing. As shown in our case studies, some B2G information-sharing requires establishing a legal framework and a formal policy, while others were done voluntarily. Legal frameworks and formal policies formalize roles, responsibilities, and tasks in information-sharing. Moreover, they formalize control over information, for instance, to protect information generated and shared throughout the information chain. This acts as the legal binding for all participants in guiding information-sharing activities, ensuring shared data quality, and using the information-sharing system (Sayogo et al., 2020).

Regulatory factors play an important role in inter-organizational information-sharing and collaboration (Qin & Fan, 2016). Providing a specific policy, or mandating information-sharing, is a powerful tool to increase participation. Yang et al. (2014) observed that government mandate in Taiwan creates formal pressure to push organizations to adopt an integrated information-sharing system. According to them, an integrated system requires a legal framework as a reference to bring together all parties. This is in contrast with distributed or point-to-point information-sharing, which only requires agreements between the parties involved.

Drawing on previous work (i.e. (Qin & Fan, 2016) and (Peng, 2015)), we developed the measurement indicators for this variable to measure whether the information-sharing is mandated or not. A 5 point *Likert-scale* was used, with value 4 representing obligatory information-sharing while value 0 representing voluntarily information-sharing.

#### 5.1.1.2 Agreements among participants (AGPA)

Most of the investigated inter-organizational information-sharing cases require several agreements on architecture and governance aspects between participants. Establishing agreements among

participants is considered one of the key enablers of B2G information-sharing (European-Commission, 2018). Information-sharing agreements are useful to ensure the commitment to reduce asymmetric information among participants by providing access to information. The agreements should address the objectives of information-sharing, the sharing mechanisms (including what information to exchange, how it will be exchanged, and when the exchange will take place), the scope of data usage, and the responsibility of each organization involved in information-sharing (European-Commission, 2018; OECD, 2018).

This study treats agreements between involved parties as a latent variable. To conclude whether there was an agreement between the participants, the measurable items developed were asked if respondents understand the roles and responsibilities of their organization and the existence of a common (or shared) goal in their information-sharing. For this variable, a 5 point *Likert-scale* was used, with the value 4 representing information-sharing based-on agreement among participants, while 0 indicates that there is no agreement among participants for information-sharing.

#### 5.1.1.3 Decision-making structure (DMST)

Effective decision-making is important in complex inter-organizational relationships (Karkkainen & Hallikas, 2006). In a inter-organizational setting, coordination in decision-making may be required, especially when an organization begins to consider the existence or influence of other organizations in their decision-making processes (Wong & Acur, 2010). Reflecting on what happens in inter-organizational relationships, decision-making in information-sharing can be challenging due to several reasons, such as: decisions of one party may impact other parties, relevant information is sometimes unavailable or inaccessible to all parties, the existence of power asymmetry among parties, and the dynamic nature of the relationship among parties (Karkkainen & Hallikas, 2006). Those challenges may influence the decision-making structure in B2G information-sharing.

In the implementation of XBRL-based reporting system, we found two poles in decision-making structures: hierarchy-based and consensus-based. *Hierarchical* decision-making structure requires (formal) authority and involves a chain of command from the power holder to other parties. A hierarchical decision-making structure is suitable in situations when the decision is needed quicker or has a time limit (e.g., in an emergency), demands better accountability of who decides what and when, or when the majority of participants refuse or are unavailable to participate (Dressler, 2006).

On the other hand, a *consensus* is a decision-making process in which all participants negotiate decisions in the best interest based on their own situations and by looking at others (Bressen, 2012) to achieve collective agreements. Consensus-based decision-making requires participants to feel committed to a common goal, input from each participant, trust among participants, and good faith in solving all problems (Dressler, 2006). Consensus is beneficial in empowering or encouraging participation and distributing power among all involved parties. However, achieving consensus is considered more challenging in larger groups or when the decision needs to be made quickly (Dressler, 2006).

For this study, we developed measurement indicators that address hierarchy-based vs. consensus-based decision-making structure. A 5-point *Likert-scale* was also used for this variable, with 0 meaning no participation and 4 representing a participative decision-making structure.

#### 5.1.1.4 Typology System (TYSY)

The typology variable deals with choosing a dyadic or multilateral approach for information-sharing. From the two case studies, we found that information-sharing can be done through point-to-point or a hub-type (many-to-many) typology. In the dyadic typology, the sending partner has to build a direct electronic link to the receiving partner, therefore, more sharing partners require more direct links to build. In the multilateral typology, a single system is used to communicate with all the sharing partners, so the participants do not need to build a direct connection to each sharing partner but to build connections to the hub.

We could not find any references to measurement indicators for the typology variable. Therefore, we developed the measurement indicators used for this study in accordance with dyadic versus multilateral connections. A 5 point *Likert-scale* was also used for this variable, with the value 4 representing a multilateral approach while 0 representing a dyadic approach.

#### 5.1.1.5 Level of Technical Standardization (LTST)

A standard is "a technical specification, adopted by recognized standardization bodies, for repeated or continuous application" (European-Union, 2012, p. 19). Adopting standards for the system architecture plays a crucial role in realizing interoperable and compatible solutions (Davies et al., 2008; Janssen & Cresswell, 2005), although the availability of standards alone is insufficient for accomplishing interoperability (European-Commission, 2017). The use of standards in information-sharing comprises data - metadata, application, platform, and process, including the use of an algorithm for calculation, data processing, and automated reasoning - aims to tackle the technical compatibility and interoperability issues.

As involved organizations may have heterogeneous information systems, interoperability becomes a critical point to be addressed in information-sharing system. Interoperability itself can be defined as "the ability of organizations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organizations, through the business processes they support, by means of the exchange of data between their ICT systems" (European-Commission, 2017, p. 5). By using the definition of interoperability, the adoption of standards can be considered a key element of information-sharing arrangements. Standardization has an influence on the processing of shared information and deals with the quality of information-sharing.

In this study, we asked whether information-sharing system in which the respondents use or have experience is deploying data and process standardization. 5-*Likert-scale* for this variable was built with direction 0 towards no data and process standardization, while 4 explains data and process standardization in information-sharing system.

### 5.1.2 Exogenous Constructs: Factors

Exogenous constructs consist of a list of potential factors influencing B2G information-sharing arrangements, which are grouped into inter-organizational, organizational, and technological factors. Measurement indicators for all exogenous constructs are presented in Appendix C.

#### 5.1.2.1 Inter-organizational Factors

The scope of this study is information-sharing within government agencies and private companies. B2G information-sharing relies heavily on inter-organizational relationships (Pardo & Tayi, 2007). Issues that can influence information-sharing arrangements can be found in the relationship between inter-governmental agencies (e.g., which agency should lead the information-sharing implementation), between private companies (e.g., maintaining competitive advantage in the hypercompetitive market), or between government agencies and private companies (e.g., IT capability gap, investment method, or unbalance benefits).

Inter-organizational factors in this study consist of factors required in the development of inter-organizational relationships. The case study identified two key factors in information-sharing arrangements: level of trust and power asymmetry. Therefore, inter-organizational variables in this quantitative study were focused on those two factors.

1) Distrust to Sharing Partners (DTSP)

Inter-organizational trust can be defined as "an organization's belief that partners will perform actions that will result in positive outcomes, as well as not taking unexpected actions that would result in negative outcomes for the organization" (Neergaard & Ulhøi, 2006, p. 522). Inter-organizational information-sharing depends on participants' trust-building and is key in developing inter-organizational relationships (Hart & Saunders, 1997; Yang & Maxwell, 2011). In this study, we use trust to reflect the perception of an organization (through the lens of individuals working in the organization) towards the other parties involved in B2G information-sharing. The potential loss of competitive advantage, an imbalance of benefits among organizations, and differences in treatment favoring a particular organization may decrease the level of trust among participants (Sayogo et al., 2017), while prior collaborations of stakeholders in joined projects and also prior sharing information between them can lead to a higher level of trust among participants (Praditya et al., 2017). Furthermore, trust can directly affect or play a role as a mediating variable for successful inter-organizational information-sharing (Sayogo et al., 2017).

The conceptualization of trust is complicated because trust is seen as a multidimensional concept (De Reuver, 2009) and definitions provided by prior research are sometimes confusing (Harrison McKnight & Chervany, 2001). For this research, we adopted measurement indicators from Krishnan et al. (2006) without performing code reversal. Instead, we modified the variable name to distrust to sharing partners. Although trust and distrust for some studies are distinct and separate constructs (see Rusk (2018)), they can be included in the same continuum (and can be used interchangeably) if what is being measured is the level of trust (Harrison McKnight & Chervany, 2001).

Moreover, trust might play an important role in network governance in terms of influencing information-sharing arrangements. The level of trust and network governance have a reciprocal relationship. On the one hand, the level of trust can be considered a distinguish antecedent of network governance compared to other types of governance (e.g., market, hierarchy). On the other hand, a higher level of trust generated in the implementation of network governance would positively impact network performance (Klijn & Koppenjan, 2012). From the system architecture point-of-view, the level of trust among participants in information-sharing influences the typology of inter-organizational system (IOS) used in information-sharing, with higher-level distrust leading to an increase in the number of IOSs and point-to-point connections used among participants (Romochkina et al., 2016).

Therefore, trust potentially influences B2G information-sharing arrangements in system architecture and governance. Thus, the hypotheses are:

**H1a: A higher-level of distrust among participants results in the implementation of hierarchical governance.**

**H1b: A higher-level of distrust among participants results in the implementation of a fragmented information-sharing system.**

The questions for this variable were collected from prior research with adjustment to the B2G information-sharing context. A 5-point *Likert-scale* was also used for this variable, with 0 indicating a low-level of distrust to sharing partners while 4 indicating a high-level of distrust among participants.

2) Power Asymmetry (POAS)

The parties involved in inter-organizational information-sharing might have differential access to economic resources, market power and might have information or technological advantage, which creates the existence of power asymmetry in the relationship among those parties (Budd, 2015). The main concern of power asymmetry is related to the potential misuse of authority or abuse of power for specific purposes or to benefit certain parties. Power asymmetry can influence the selection, implementation, or use of certain arrangements in information-sharing (Bharosa, Janssen, van Wijk, et al., 2013; Hart & Saunders, 1997; Knol et al., 2014).

The existence of power asymmetry creates levels of super-ordination and subordination. In an encapsulated system such as information-sharing, the superordinate represents an organization (or a small number of organizations) as the power holder, which in most cases are government agencies, and subordinate terms refer to other participants (Ashenbaum, 2018; Boonstra & de Vries, 2005). The decision made in the system is mostly determined by the power-holder through hierarchical governance. Furthermore, power-holder tends to demand access to all the shared information and control of the system. This situation might be easier to be achieved using an integrated system (Kurnia et al., 2019).

In addition, Farrell (2004) explains the relationship between trust and power in an encapsulated system is: “it should account for the difficulties of maintaining trust in a situation of extreme disparities of power between actors. On the other hand, it should be able to accommodate trust in relationships where disparities of power between actors exist but are less marked. Clearly, it must thus be able to distinguish between those social situations in which power drives out trust (and often leads to distrust) and those situations in which power and trust are not mutually exclusive” (p. 3). Therefore, the existence of power asymmetry is potentially influencing B2G information-sharing arrangements in both system architecture and governance and the second hypothesis is:

**H2a: The existence of power asymmetry results in the implementation of a hierarchical governance structure.**

**H2b: The existence of power asymmetry results in the implementation of an integrated information-sharing system.**

The information position might affect the trust among participants (Sayogo et al., 2017). In addition, as inter-organizational information-sharing reflects the encapsulation system with many parties involved. The next hypothesis is:

**H3: The existence of power asymmetry results in distrust among sharing partners.**

The measurement indicators for this variable confirmed whether respondents perceived that any parties held more power than others in their information-sharing. The questions were well-developed by prior research. For this variable, we also used a 5 point *Likert-scale* with 0 indicating there is no power asymmetry among participants of information-sharing while 4 representing a power asymmetry among participants of information-sharing.

#### 5.1.2.2 Organizational Factors

Organizational factors deal with the internal settings and capabilities of the firm, which can influence the information-sharing arrangements. In this study, organizational factors comprise perceived benefits and perceived costs in implementing certain arrangements and organizational readiness. This includes organizational culture, experience, resource allocation, organizational structure, and compatibility.

1) Perceived benefits (PEBE)

As presented in Chapter 3, certain benefits can depend on the type of information-sharing arrangements. Fragmented and less standardized information-sharing systems can reflect simplicity, ease to use, and a faster sharing process. However, they can be less useful in improving data quality, reducing administrative burdens, and improving an organization's business process, which can be achieved using integrated information-sharing systems.

Based on the case study, we determined that certain arrangements bring more benefits than others. In addition, while designing this study, we had difficulties creating measurement indicators to test the relationship between certain information-sharing arrangements and certain benefits. Therefore, related to the perceived benefits variable, we hypothesize that an integrated architecture and network governance bring more benefits for the information-sharing participants, and the hypothesis to be tested are:

**H4a: Expectation of more benefits results in the implementation of network governance.**

**H4b: Expectation of more benefits results in the implementation of an integrated information-sharing system.**

2) Perceived costs (PECO)

Organizations might be concerned about the potential costs of implementing innovations. The cost can be adoption costs, including implementing a new internal system to ensure interoperability and compatibility, adjusting to a certain data format, or training costs for employees to use the new system. Lowering costs can be considered as a key variable in an organization's adoption strategy.

Many organizations use multiple types of analyzes to assess every penny they spend before adopting new technologies. For private companies, the logic is that if the value created (not necessarily

on financial aspects) is greater than the costs incurred within a certain period (e.g., for ROI calculation), the adoption can be carried out. In contrast, for government agencies, the cost-benefit calculation may be more difficult for several reasons. First, they look at the public values, such as providing and ensuring market transparency and fairness. Next, project implementation is usually larger in scale, time-frame may be longer, or the costs and benefits felt by the government may be hard to quantify or even intangible. Accordingly, when the innovation relates to matters that are government responsibilities, for example, facilitating compliance, countering threats (e.g., in the cyber-security domain), or providing public services, there is a high chance it would be executed regardless of the costs.

Mandating or providing a regulation or policy that requires using a specific arrangement can be beneficial as a "basic incentive" for organizations. Implementing new technologies for information-sharing can be costly for an organization, and requiring sharing data using certain standards, especially for long-term use, will make it inevitable to adopt it. The IT department will also have a solid ground to convince top management about the investments needed. However, whether to adopt a built-in system or a bolt-on system will remain an option. For the perceived costs variable, we proposed that information-sharing arrangements in which preferable concerning the costs are fragmented information-sharing systems and hierarchical governance. These arguments led us to the following hypothesis:

**H5a: Higher perceived cost results in the use of a hierarchical governance structure.**
**H5b: Higher perceived cost results in the use of a fragmented information-sharing system.**

The measurement indicators used in this variable are based on asking the perceptions of the respondents related to perceived costs, especially in terms of investment value and time required to implement information-sharing. Using a 5 point *Likert-scale*, 0 equals less perceived costs, and 4 indicates higher perceived costs.

3) Organizational readiness

Organizational readiness is a broad concept that includes many aspects. For information-sharing, organizational readiness encompasses organizational culture, experience, resource allocation, organizational compatibility, and Organizational structure, which influence information-sharing arrangements. Organizational culture can be defined as "the norms and value systems that are shared among the employees of an organization (Hill et al., 2014, p. 387) and "control their interaction internally (with each other) and externally (with customers, business partners, or external stakeholders)" (Hill & Jones, 2011, p. 240). A culture of sharing, collaboration, and innovation are decisive in overcoming barriers (i.e., resistance to change, lack of trust, or information asymmetric) that may occur during information-sharing (Jiang & Li, 2010; Yang & Maxwell, 2011). Having experience in information-sharing is one aspect of organizational readiness. According to prior studies, public organizations without experience in information-sharing tend to be more cautious and resistant to join the information-sharing arrangement due to a lack of understanding of the benefits that can be obtained (Bekkers, 2009; Yang & Maxwell, 2011). A lack of resources, such as staff shortage or lack of budget, is also one of the organizational factors referred to as inhibiting new technology adoption (Yang & Maxwell, 2011). Lack of resources makes an organization prioritize an urgent issue within the

organization and overlook other issues; even if they are joining information-sharing, they tend to be passive participants (Crowther, 2014).

Organizational compatibility deals with aligning innovations with the organization's values, beliefs, and systems (Premkumar et al., 1994). Organizational compatibility leads to a unified goal and needs within an organization. Benefits will be potentially easier realized for the participants of information-sharing if the objective of information-sharing aligns with the organization's goals or if their employees already have knowledge and skills about the information-sharing system (Praditya & Janssen, 2015). Lastly, Organizational structure deals with structure and formalization adopted in the organization. When dealing with external parties, an organization tends to reflect on what they have internally. In the context of information-sharing arrangements, for example, if an organization already formalized their procedures, business processes, or policies, they most likely expect similar formalization when doing information-sharing, which means moving towards a hierarchical approach (Qin & Fan, 2016). Considering the above matters, we argue that if organizations can establish higher readiness levels, they can implement seamless and integrated information-sharing. For the information-sharing governance, except for organizational governance, which might lead to a hierarchical approach, other variables potentially led to network governance. Therefore, the following hypotheses are developed:

**H6a: A Culture of innovativeness in an organization results in the implementation of network governance.**

**H6b: A culture of innovativeness in an organization results in the implementation of an integrated information-sharing system.**

**H7a: A higher level of organizational readiness results in the implementation of network governance.**

**H7b: A higher level of organizational readiness results in the implementation of an integrated information-sharing system.**

**H8a: A higher level of organizational compatibility results in the implementation of network governance.**

**H8b: A higher level of organizational compatibility results in the implementation of an integrated information-sharing system.**

**H9a: Implementation of hierarchical governance for information-sharing systems is preferred by hierarchical organizations.**

**H9b: Implementation of an integrated information-sharing system is preferred by hierarchical organizations.**

Like other variables, we also used a 5 point *Likert-scale* to measure organizational culture, readiness, compatibility, and Organizational structure. The direction of the scale was aligned with each hypothesis above. For organizational culture, 0 represents the absence of a culture of innovativeness in the organization, whereas 4 represents the presence of a culture of innovativeness in the organization. Next, for organizational readiness, 0 indicates a low-level of organizational readiness while 4 indicates a high-level of organizational readiness. In terms of organizational compatibility, 0 means a low-level of organizational compatibility and 4 means a high-level of compatibility. Lastly, 0 represents an absence of hierarchical structure of the organization, while 4 represents the presence of hierarchical structure of the organization.

#### 5.1.2.3 Technological Factors

B2G information-sharing means the transfer of data (can be either public or private data) from companies to the IT environment of the public organizations to be derived for public interest purposes (European-Commission, 2018). For information-sharing several technological issues have to be addressed related to the system quality. As explained by DeLone and McLean (1992), system quality is a variable to evaluate the dimensions or characteristics of the information system which produces the information. System quality deals with user perceptions regarding their interaction with the system (Bharosa, 2011). System quality can be measured using criteria such as system security, compatibility, flexibility, and reliability.

The concern related to the privacy and confidentiality of the shared data and the diversity of the participating organizations requires a protected and secured environment in the whole information chain (Sayogo et al., 2020). This is needed to minimize the risk of exposing information to unauthorized parties. The information-sharing system must then be designed to address the tenets of information security: confidentiality, integrity, and availability (CIA). Second, as participants may have heterogeneous information systems, the information-sharing system must be compatible with each of the participants' system so the required data can be shared between systems (Sayogo et al., 2020); compatibility in this study mainly relates to software compatibility and the use of a common interface in information-sharing.

The third dimension is technical flexibility, which deals with the ability to accommodate a variety of user needs and the potential of changing conditions. This dimension is important to ensure scalability in dealing with more participants, using different standards, or expanding the use of information-sharing systems in other domains. Last, system reliability, which can be defined as "the extent to which a system performs adequately according to its design or purpose for a given time and in a given environment" Bharosa (2011, p. 70), is also considered an important factor for an information-sharing system. Information-sharing can be done during a specific period of time or executed based on request; some are required to be processed in real-time, some through batch processing. In all cases, the information-sharing systems need to be reliable, especially during peak times.

For the hypotheses, all of the aforementioned technological factors potentially influence B2G information-sharing arrangements in both system architecture and governance. However, these factors can have different effects on information-sharing arrangements. Thus:

**H10a: System quality requirements result in the implementation of network governance.**

**H10b: System quality requirements result in the implementation of an integrated information-sharing system.**

**H11: System quality requirements result in the need for technical support.**

**H12a: The need for a secure system results in the implementation of hierarchical governance.**

**H12b: The need for a secure system results in the implementation of a fragmented information-sharing system.**

**H13a: The need for technical compatibility results in the implementation of network governance.**

**H13b: The need for technical compatibility results in the implementation of an integrated-information system.**

**H14: The need for technical compatibility results in the need for technical support.**

As found in our case study, technical support is provided in some B2G implementations to address the technology gap or complexity of information-sharing. Technical support can range from technical guidance documents to having a helpdesk to help participants during the software installation process or troubleshooting when it is operational. The availability of technical support can bridge to establish the level of IT capability of participants so organizations with a low IT-maturity can adopt more advanced technological information-sharing arrangements.

Implementing all technical requirements (and improvements) adds to the complexity of information-sharing systems and makes it technically difficult to address using a fragmented approach. On the other side, technical complexity in B2G information-sharing requires interaction and collaboration among involved parties due to interdependencies, especially in problem-solving, as resources to solve the problem may be owned by other parties (Klijn & Koppenjan, 2012). However, from the security concern perspective, the preferable arrangements might be different. An encrypted, distributed system with hierarchical governance is preferable to have easier control and restrict potential security risks (Kishi et al., 2010). Therefore, the next hypotheses address the influence of the availability of technical support in information-sharing arrangements:

**H15a: Availability of technical support results in the implementation of network governance.**

**H15b: Availability of technical support results in the implementation of an integrated information-sharing system.**

In addition, developing a secured information-sharing system will likely improve trust among participants. This results in the following hypothesis:

**H16: Developing a secured system results in higher levels of trust among participants.**

As mentioned before, technical requirements in this study are constructed from criteria as follows: 1) system compatibility; 2) system security; 3) system quality; and 4) availability of technical support. A 5 point *Likert-scale* was also used for all technological factors variables and aligned with the developed hypothesis. For system quality, 0 represents no need for system quality, and 4 represents a high need for system quality. Next, for system security, 0 indicates no need for system security whilst 4 indicates a high need for system security. In terms of technical compatibility, 0 means no need for technical compatibility, and 4 means a high need for technical compatibility. Lastly, 0 represents an absence of technical support, while 4 represents a high level of technical support.

## 5.2 Survey Procedure

This study's questionnaire was distributed from December 2018 to January 2019 through an online platform called *Prolific*. The unit of measurement for this study is an organization. However, since we cannot ask for an organization to answer, individuals working in an organization are targeted as representatives for their organization. The population for this research is the workers of the platform. We then filtered respondents using two criteria: 'employment sector' and 'technology use at work'. As *Prolific* is an open platform for academic purposes, we assume that most workers are from academia. Therefore, the 'employment sector' was used to ensure that we could collect respondents from

companies and public organizations. Then the 'technology use at work' was used as a criterion to ensure that respondents have at least a basic understanding of information technology. Filtering using these two criteria resulted in approximately 9000 potential respondents from public organizations and approximately 50000 potential respondents from companies. The questionnaire was then submitted to the platform, so all potential respondents could view it and fill it in if they desired to.

According to the platform's dashboard, 475 users filled in the questionnaire. We only considered responses completed longer than 15 minutes for the user validation step, which resulted in 274 responses. Then, to further ensure the statistical results' validity, we filtered out respondents with N/A responses during the data cleansing, which resulted in 252 responses to be used for the statistical analysis.

### 5.2.1 Respondents Demographics

As presented in Table 5-1, most respondents had the experience of working with B2G information-sharing for at least two years. Hence, we assumed that the respondents understood the topic well, and their responses were representative for capturing the existing condition of their information-sharing initiatives.

**Table 5-1 Respondents' Demography of this study**

| Experience in B2G information-sharing | | |
|---|---|---|
| 0 - 2 years | 72 | 29% |
| 2 - 5 years | 130 | 52% |
| 5 - 10 years | 30 | 12% |
| more than 10 years | 20 | 8% |

| Gender | | |
|---|---|---|
| Female | 83 | 33% |
| Male | 167 | 66% |
| Missing | 2 | 1% |

| Age | | |
|---|---|---|
| Younger than 30 years old | 117 | 46% |
| 30 - 40 years old | 79 | 31% |
| 41 - 55 years old | 46 | 18% |
| older than 56 years old | 9 | 4% |
| Missing | 1 | 0% |

| Organization Size | | |
|---|---|---|
| 1-10 | 29 | 12% |
| 11-50 | 43 | 17% |
| 51-250 | 75 | 30% |
| 251 - 1000 | 46 | 18% |

| Type of Organizations | | |
|---|---|---|
| Private-sectors | 182 | 72% |
| Public-Sectors | 69 | 27% |
| N/A | 1 | 0% |

| Departments | | |
|---|---|---|
| Customer Service | 40 | 16% |
| Finance/Accounting | 30 | 12% |
| Information Technology/MIS | 84 | 33% |
| Sales/Marketing | 13 | 5% |
| Corporate Marketing | 3 | 1% |
| Human Resources | 16 | 6% |
| Research and Development | 22 | 9% |
| Manufacturing | 14 | 6% |
| Engineering | 13 | 5% |
| Others | 16 | 6% |

| Type of information-sharing | | |
|---|---|---|
| Disaster Management Information System | 1 | 0% |
| E-Government Application | 34 | 13% |
| Financial Reporting System | 88 | 35% |
| Geospatial Information System | 7 | 3% |
| Public Safety Network | 26 | 10% |

| | | |
|---|---|---|
| more than 1000 | 58 | 23% |
| N/A | 1 | 0% |

| | | |
|---|---|---|
| Research Collaboration System | 28 | 11% |
| Supply Chain Information System | 42 | 17% |
| Vehicle Information System | 20 | 8% |
| Others | 6 | 2% |

Furthermore, respondents work in various departments, one-third of them work in the IT Department, 16% work in the Customer Service Department, 12% work in the Finance Department, and the rest are spread across various organizational functions. In addition, Table 5-1 also shows that the respondents work with various domains of B2G information-sharing, including financial reporting, supply chain information, E-government application, and research collaboration systems.

Lastly, the ratio of respondents from public organizations versus private organizations was 27% against 72%. This figure represents the selected population of the *Prolific* workers as the survey platform of this study. We consider the ratio to be acceptable for further analysis since the number of businesses in the B2G information-sharing is usually more than the number of governments.

## 5.3 Descriptive Analysis of Information-Sharing Arrangements

In this section, we present a descriptive analysis to provide basic information about the distribution of responses of the measured variables. Since we used many variables in the survey, which also means more measurement indicators, we specifically discuss the endogenous constructs (i.e., the type of information-sharing arrangements used by the respondents), supplemented by the level of respondents' satisfaction and level of respondents' confidence in the information-sharing in this section. The detailed descriptive analysis of all measurement indicators can be found in Appendix B.

The first variable of the endogenous construct is the regulatory factor. For most respondents, using an information-sharing system is obligatory, intended for regulation compliance, and complying with relevant regulations. Figure 5-3 shows the percentage is around 67% for obligatory, compared to 23% for voluntary use. 70% of the respondents indicated that the use of information is for compliance purposes. This data is also consistent with prior research (e.g., Matheus et al. (2018) or Klievink et al. (2018)) and our case study findings which found that most of the B2G information-sharing is based on regulations.

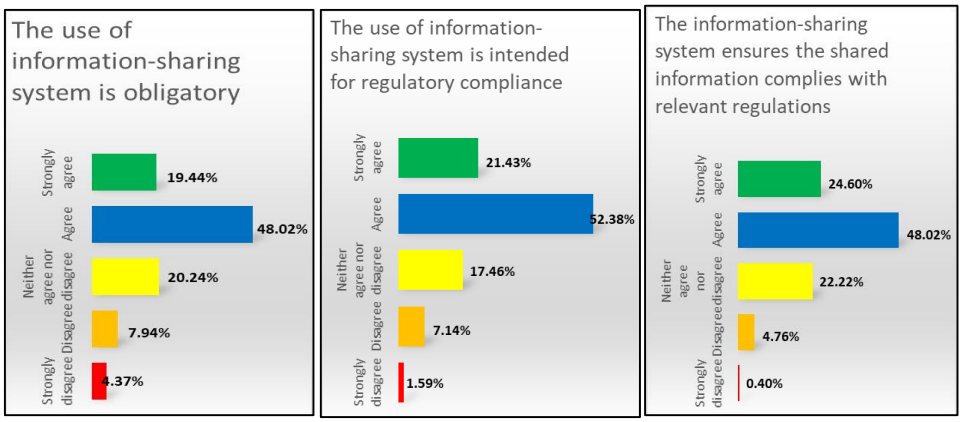


**Figure 5-3 Descriptive Analysis chart for Regulatory Factors**

Next, agreement among participants variable in this study was addressed through respondents' perception regarding availability of shared goals and understanding of roles and responsibilities in their information-sharing. Figure 5-4 shows that most respondents understand their roles and responsibilities in information-sharing; which is indicated by the total percentage for "strongly agree" and "agree" in the first three measurement indicators of this variable. Similarly, for the availability of shared goals, the majority of respondents also said that there is a common goal that is pursued and promoted in information-sharing. These indicators show that in most of the B2G information-sharing experienced by the respondents, the rules of the game are agreed upon and understood by the participants.

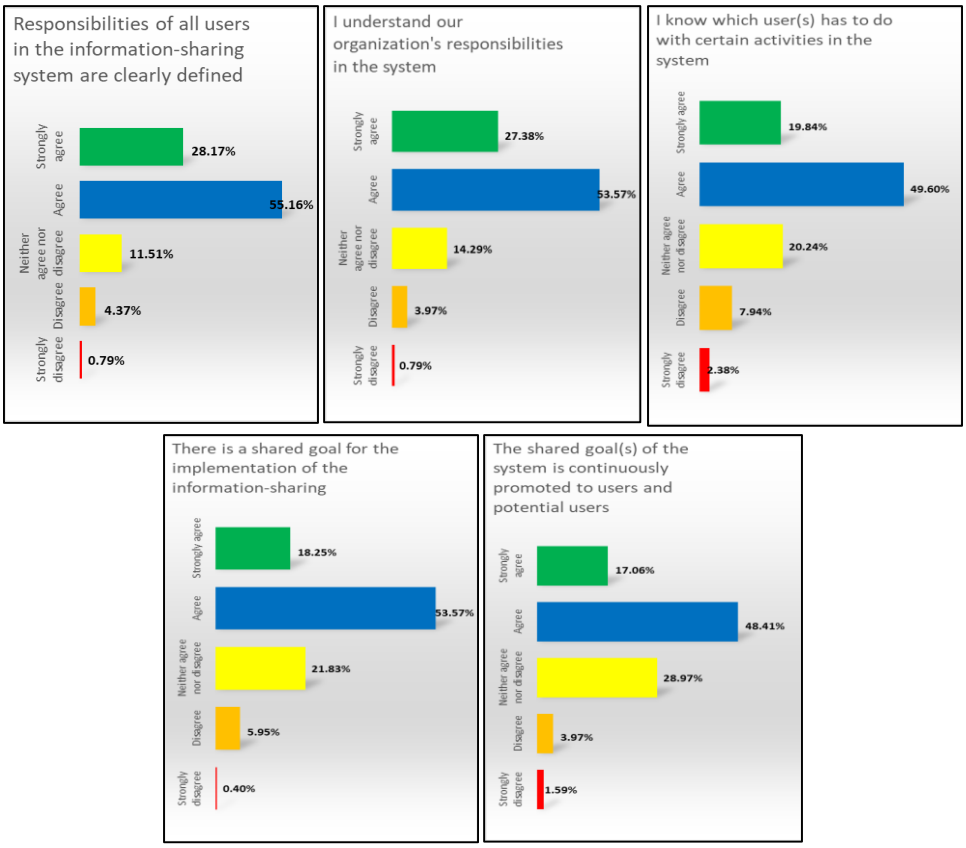


**Figure 5-4 Descriptive Analysis chart of Agreement among Participants**

Four questions are posed as measurement indicators of the decision-making structure, which are designed in pairs against each other. The results in Figure 5-5 show that the decision-making in the information-sharing arrangements of the respondents can be done through centralized, hybrid, and decentralized modes. The average figures for those modes are 17.66%, 21.92%, and 21.38%, respectively. Accordingly, the figure of decision-making structure in B2G information-sharing of the respondents of this study is almost equally using a centralized, federated, and decentralized mode.

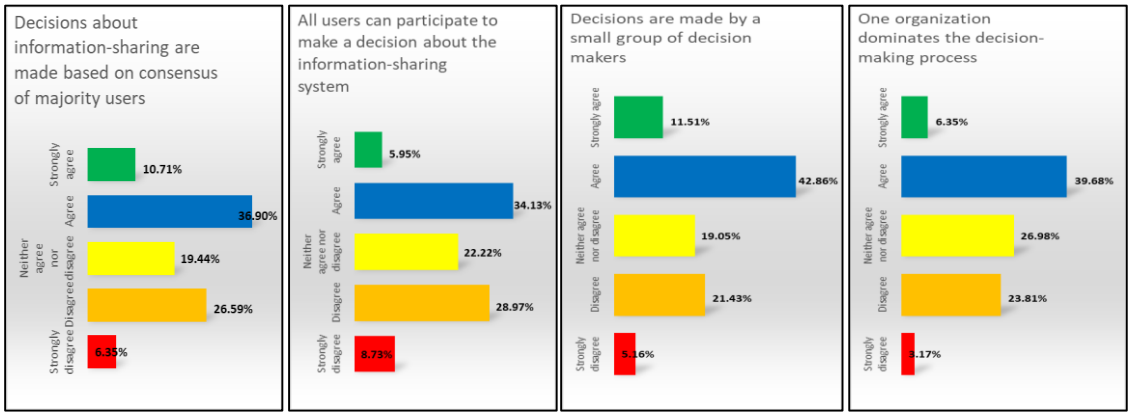


**Figure 5-5 Descriptive Analysis chart of Decision-Making Structure**

The first variable of the information-sharing system architecture is the typology of information-sharing. Figure 5-6 shows that the percentage of multilateral typology shows an almost similar figure, which is around 39% from the first indicator and 35% from the second indicator. Moreover, about 14% of the respondents answered a dyadic typology from the first indicator, but the expected equivalent scale from the second indicator shows more than 35%. Similarly, over 49% of the respondents said that they are using a hybrid typology from the first indicator, but the expected equivalent scale on the second indicator shows only about 29%. The gap or inconsistency for dyadic and hybrid may have resulted from a lack of clarity from the measurement indicators used in this research or the respondent's lack of understanding of the type of typology used in information-sharing.

This variable shows that no dominant typology is used in B2G information-sharing based on the respondents of this study.

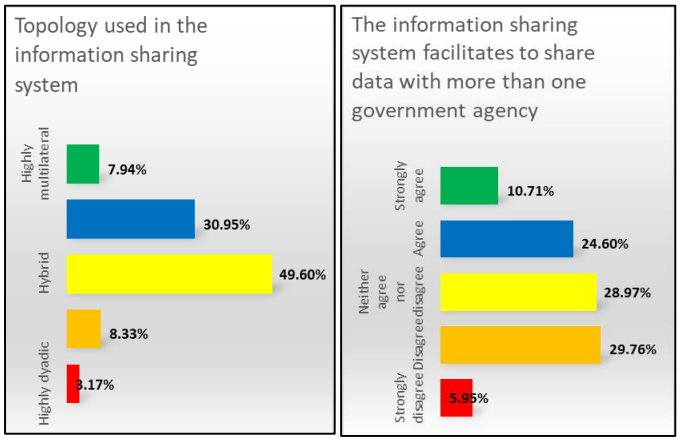


**Figure 5-6 Descriptive Analysis chart for Typology of Information-Sharing**

The next variable is the level of technical standardization implemented in the information-sharing system. The indicators are divided into the use of data standardization and process standardization. For data standardization, the majority of respondents stated that their information-sharing is implementing data standards and pre-structured data format. The respondents selected over 80% for standards and over 70% for pre-structured data for those two indicators. Moreover, we used six indicators divided equally over the automation process, user validation, and activity flow for process standardization.

Figure 5-7 shows that for the five indicators, most respondents believe their information-sharing is implementing a certain level of process standardization. The only exception is regarding manual work required in information-sharing, which the majority of the respondents were unsure about. This may be due to the indicator using the term "less than" which indicates a comparison to something (whether against other information-sharing systems or arrangements used previously), and this is unclear. Nevertheless, from the figures of this variable, we can argue that in B2G information-sharing used by the respondents, certain data and process standardization levels are implemented.

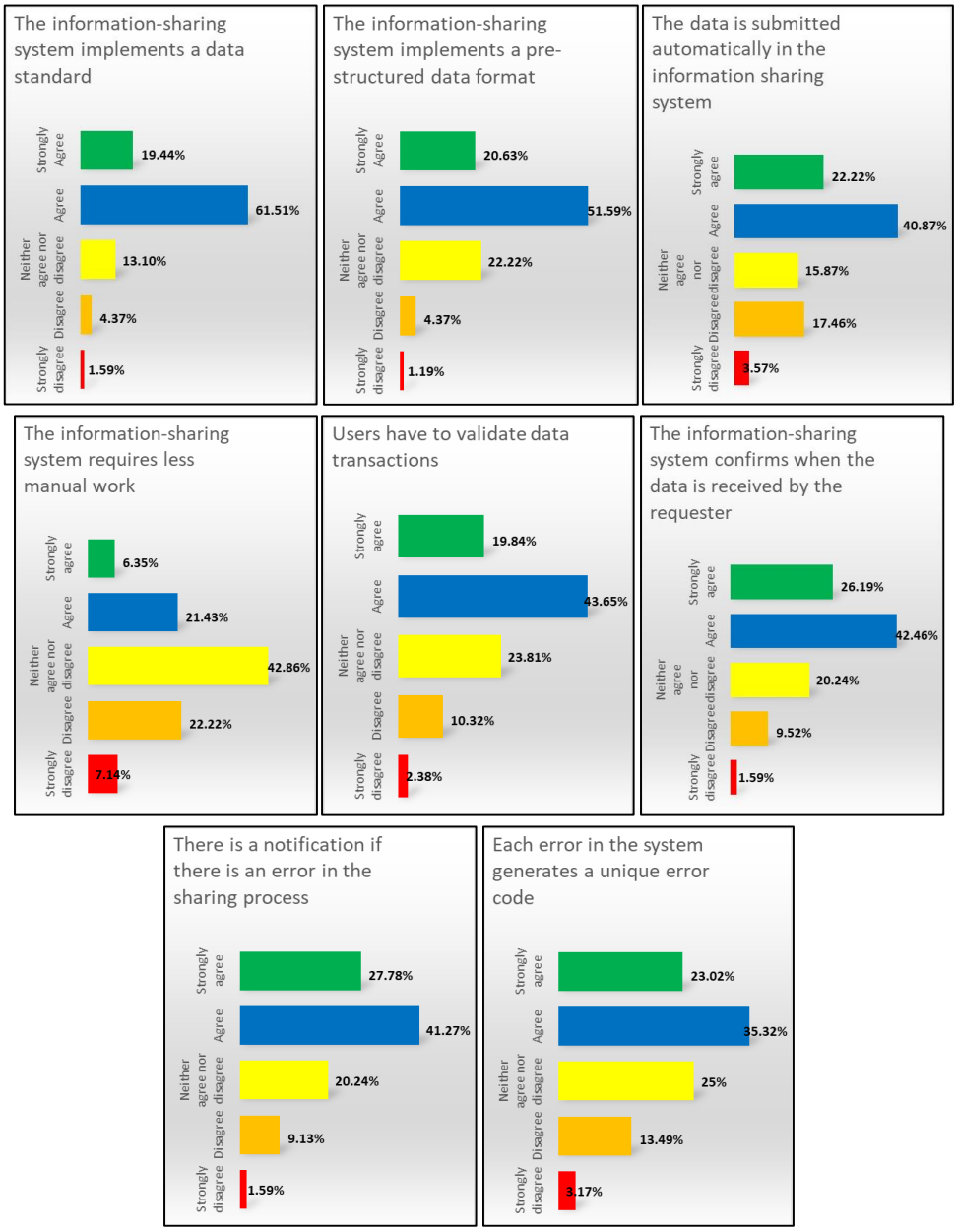


**Figure 5-7 Descriptive Analysis chart for Level of Technical Standardization**

Then, we were asked six questions about user satisfaction and four questions about user confidence. For the user satisfaction, we wanted to capture whether the respondents were satisfied with how the decision were made in the information-sharing, with the infrastructure used for

information-sharing, with the quality of shared data, and with the process of information-sharing. Two questions were asked about whether the respondents wanted to keep using the system and encourage their business partners to use similar information-sharing systems.

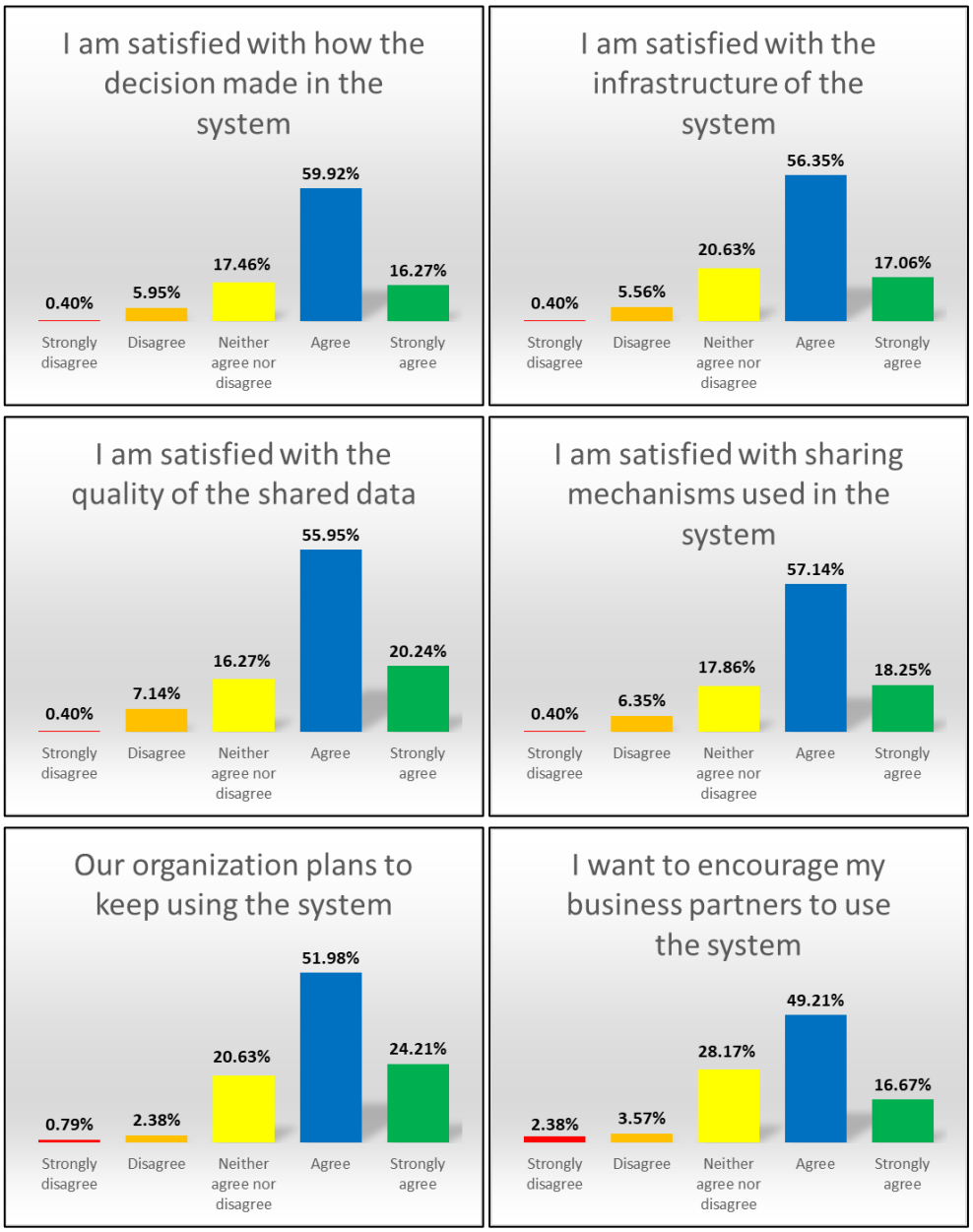


**Figure 5-8 Descriptive Analysis chart of Respondents' Satisfaction in their Information-sharing Arrangements**

In general, we found that majority of respondents were satisfied with their information-sharing arrangements. The aggregate percentage of agree and strongly agree contains more than 75% of responses for all the measurement indicators asked. This is slightly different when encouraging the business partner to use the system, which is around 65%.

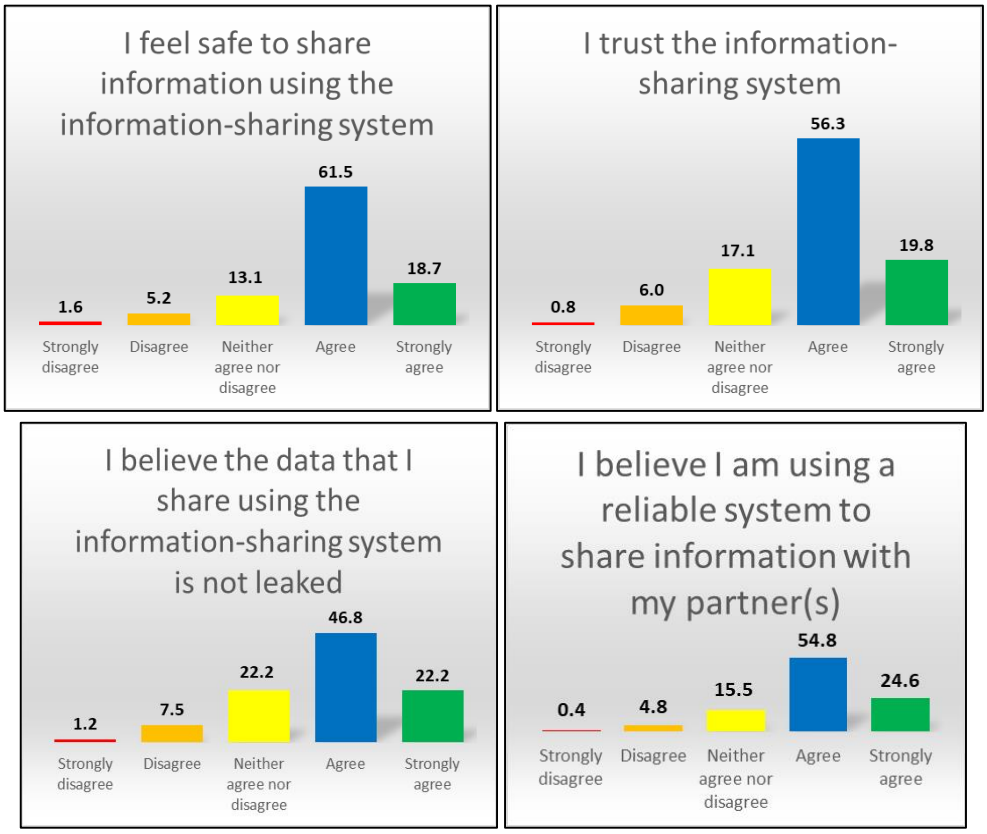


**Figure 5-9 Descriptive Analysis chart of Respondents' Confidence to their information-sharing**

As for the level of confidence in information-sharing system, we asked about the respondents' perception about feeling safe to share using the system, trust in the system, data confidentiality, and the reliability of the information-sharing system. Similar to the level of satisfaction, the percentage of agree and strongly agree in all indicators in user confidence contain the answers of over 70% of the respondents.

In addition, the descriptive analysis results indicate a possible relationship between the application of regulation on user satisfaction and user trust. We can also analyze which arrangements affect user satisfaction and trust from these relationships. This could be an avenue for further research, as this is not the scope of this study.

## 5.4 Results of the Exploratory Factor Analysis

Although this study aims to test the causality between variables that explain a particular phenomenon, we need a preliminary step to evaluate the aforementioned variables. Previous studies have identified factors that influence inter-organizational information-sharing. However, to our knowledge, only a few studies translated factors into quantitative variables. Moreover, most of the adopted variables needed to be adjusted to the context of this study. For that purpose, we conducted Exploratory Factor Analysis (EFA). Using the EFA, we evaluate the correlation between measurement indicators to combine them into relevant variables (Costello & Osborne, 2005; Field; Yong & Pearce, 2013). We continued this process until we got the consistent indicators loaded into a fixed number of

variables (or factors in EFA). We developed the basic structure for hypothesis and model testing by applying EFA.

There are several considerations when conducting analysis using EFA. According to Hair et al. (2006) some problems may occur when conducting EFA, including: (1) a variable has no significant loadings; (2) even with a significant loading, a variable's communality is deemed too low; and (3) a variable has a cross-loading indicator. To deal with those problems, several solutions suggested by Hair et al. are: 1) ignore problematic indicators and interpret the solution as is, although it may result in poorly formed variables; 2) consider possible deletion of variables, especially for less important variables and variables that have unacceptable communality value; 3) try alternative rotation method, for example, using oblique method if orthogonal had been used or vice versa; 4) decrease or increase the number of factors retained which is useful to check whether a less or more factor structure will solve the problem or not. Since "over-extraction and under-extraction of factors retained for rotation can have deleterious effects on the results" (Costello & Osborne, 2005, p. 2), we must carefully evaluate the number of variables retained for model testing.

The following parameters for EFA (Hair et al., 2006) were applied using SPSS Statistics version 26:

1) Extraction method: Maximum likelihood;
2) Selecting the number of factors providing the eigenvalue = 1;
3) Oblique rotation with delta = 0 (allowing factors to be correlated). However, in the next step, we deleted all indicators that caused cross-loading factors;
4) Suppress small coefficients for absolute values below 0.3 (low loading value).

The next measurement is Cronbach's alpha for a reliability test. The accepted value of Cronbach's alpha in information system research is 0.7. However, values above 0.6 are also accepted (Hair et al., 2006; Taber, 2018). For this research, we accept variables with Cronbach's alpha value higher than 0.6. Using the above evaluating parameters, EFA results show which measurement indicators have to be removed and which to be retained for the next analysis and how reliable the developed variables; EFA results are presented in Table 5-2.

**Table 5-2 Exploratory Factor Analysis results**

| Type of construct | Category | Variable Name | Code | Factor Loading | α |
|---|---|---|---|---|---|
| Endogenous | Governance of information-sharing | Regulatory Factor | REFA_1 | 0.824 | 0.616 |
| | | | REFA_2 | 0.525 | |
| | | | REFA_3 | removed | |
| | | Agreement among participants | AGPA_1 | removed | 0.715 |
| | | | AGPA_2 | 0.514 | |
| | | | AGPA_3 | 0.525 | |
| | | | AGPA_4 | 0.800 | |
| | | | AGPA_5 | 0.633 | |
| | | Decision-making structure | DMST_1 | 0.984 | 0.819 |
| | | | DMST_2 | 0.566 | |
| | | | DMST_3 | removed | |
| | | | DMST_4 | 0.829 | |
| | | Typology system | TYSY_1 | 0.993 | 0.807 |

| Type of construct | Category | Variable Name | Code | Factor Loading | α |
|---|---|---|---|---|---|
| | Architecture of information-sharing system | | TYSY_2 | 0.708 | |
| | | | TYSY_3 | removed | |
| | | Level of technical standardization | LTST_1 | 0.525 | 0.741 |
| | | | LTST_2 | 0.725 | |
| | | | LTST_3 | 0.580 | |
| | | | LTST_4 | 0.530 | |
| | | | LTST_5 | 0.566 | |
| | | | LTST_6 | 0.411 | |
| | | | LTST_7 | 0.389 | |
| | | | LTST_8 | 0.368 | |
| Exogenous | Inter-organizational Factors | Distrust to sharing partners | DTSP_1 | 0.792 | 0.742 |
| | | | DTSP_2 | 0.738 | |
| | | | DTSP_3 | removed | |
| | | | DTSP_4 | 0.576 | |
| | | Power Asymmetry | POAS_1 | removed | 0.713 |
| | | | POAS_2 | 0.389 | |
| | | | POAS_3 | 0.864 | |
| | | | POAS_4 | 0.826 | |
| | Organizational factors | Perceived Benefits | PEBE_1 | 0.609 | 0.805 |
| | | | PEBE_2 | 0.811 | |
| | | | PEBE _3 | 0.658 | |
| | | | PEBE _4 | 0.671 | |
| | | | PEBE _5 | removed | |
| | | | PEBE _6 | 0.624 | |
| | | Perceived Costs | PECO_1 | 0.822 | 0.634 |
| | | | PECO_2 | 0.563 | |
| | | | PECO_3 | removed | |
| | | Organizational Culture | ORCU_1 | 0.611 | 0.700 |
| | | | ORCU_2 | 0.792 | |
| | | Organizational Readiness | ORRE_1 | 0.418 | 0.760 |
| | | | ORRE_2 | 0.921 | |
| | | | ORRE_3 | 0.361 | |
| | | Organizational Compatibility | ORCO_1 | 0.535 | 0.720 |
| | | | ORCO_2 | 0.676 | |
| | | | ORCO_3 | 0.711 | |
| | | Organizational structure | INGO_1 | 0.944 | 0.709 |
| | | | INGO_2 | 0.549 | |
| | | | INGO _3 | 0.327 | |
| | | | INGO _4 | removed | |
| | | | INGO _5 | removed | |
| | Technological Factors | System Quality | SYQU_1 | 1.000 | 0.692 |
| | | | SYQU_2 | 0.368 | |

| Type of construct | Category | Variable Name | Code | Factor Loading | α |
|---|---|---|---|---|---|
| | | | SYQU_3 | removed | |
| | | System Security | SYSE_1 | 0.771 | 0.824 |
| | | | SYSE_2 | 0.624 | |
| | | | SYSE_3 | 0.599 | |
| | | | SYSE_4 | 0.777 | |
| | | Technical Compatibility | TECO_1 | removed | 0.756 |
| | | | TECO_2 | 1.000 | |
| | | | TECO_3 | 0.472 | |
| | | Availability of Technical Support | AVTS_1 | 0.544 | 0.707 |
| | | | AVTS_2 | 0.793 | |
| | | | AVTS_3 | 0.687 | |

EFA shows several findings. First, all of the endogenous and exogenous constructs were retained. Second, all of the variables were reliable for model testing because they all have an α value higher than 0.6. Third, most of the indicator items fit to their expected variable. However, 12 out of 66 measurement indicators must be removed due to low factor loading or communality values. Moreover, five variables, namely Regulatory Factor, Typology System, Perceived Costs, Organizational Culture, and System Quality, can be considered poorly formed because each was composed of only two indicators.

## 5.5 Results of the Partial Least Square Analysis

This study has proposed 28 hypotheses that were tested using Partial Least Square (PLS). The PLS was carried out using SmartPLS version 3.2.8. By looking at the total effect output that has been bootstrapped, the processing of the data obtained was compared with the statistical indicators to make the decision about the hypothesis. Three statistical indicators were used to evaluate the hypotheses (Hair et al., 2006), namely:

1) Path coefficients show the strength of the relationships and the direction (positive or negative);
2) Significant (P-value) ≤ 0.05 and;
3) T-statistic ≥ 1.64.

Then, after determining the suitability criteria, the final model was made by the results of the proposed hypotheses by referring to the type of reflective indicator (or measurement indicators) used in this study. We draw an initial model for this quantitative study from the hypothesis development in the previous section. As shown in Figure 5-10, this model illustrates the causal relationship of the factors on the left that may influence the information-sharing arrangements on the right. In addition, there are also some potential relationships between factors, as also presented in the hypothesis. The list of hypotheses is presented in Appendix B.

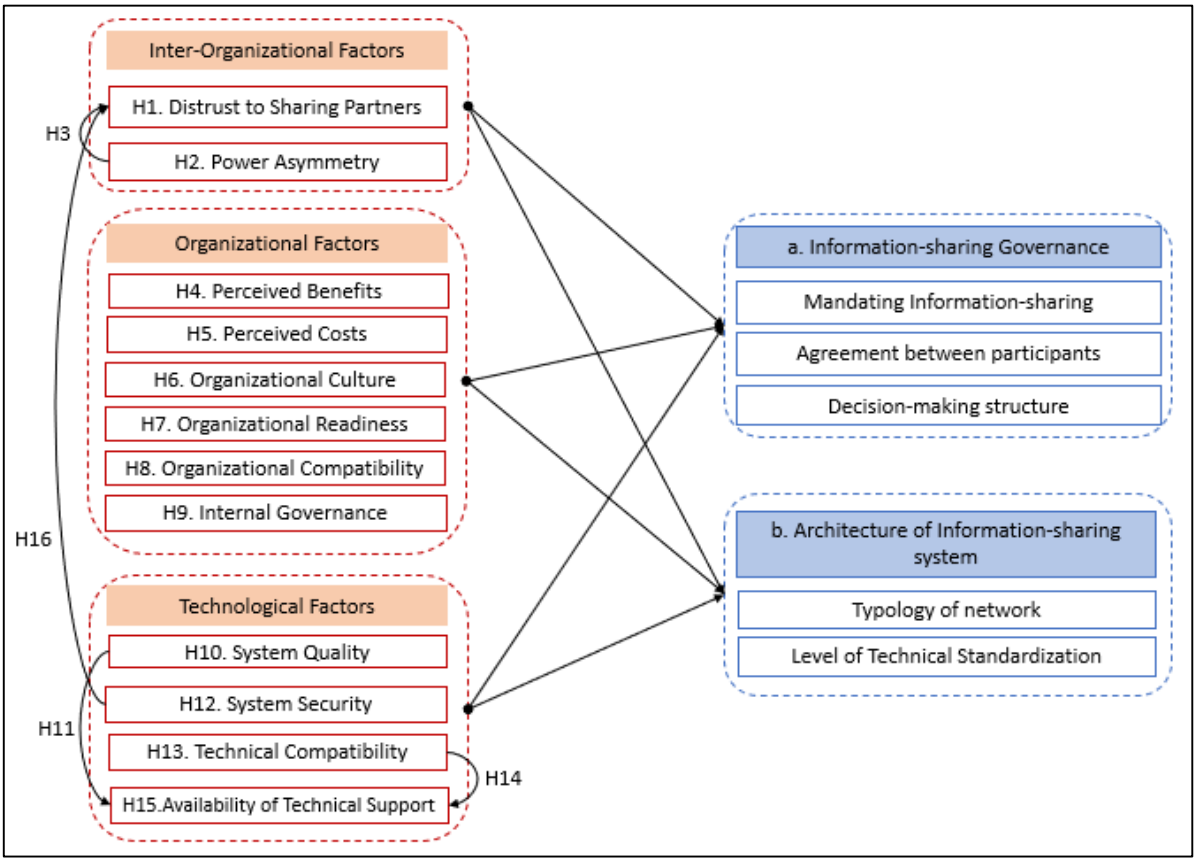


**Figure 5-10 Initial Model**

### 5.5.1 Outer Model Analysis

The Outer (or measurement) model aims to specify the relationship between latent variables and their indicators. In other words, the outer model defines how each indicator relates to its latent variable. The outer model analysis is conducted to ensure the reliability and validity of measured variables and provide support for their inclusion in the model for the inner (or structural) model analysis stage using three parameters: Convergent Validity, Discriminant Validity, and Reliability. Results of the outer model influence whether a latent variable is suitable to be included in the model evaluation (or inner model testing).

**Table 5-3 Criteria of Outer Model Evaluation**

| Criteria | Parameter | Accepted Value |
|---|---|---|
| Convergent Validity | Loading Factor | ≥ 0,7 |
| | Average Variance Extracted (AVE) | > 0,5 |
| Discriminant Validity | Square root AVE & Correlation of Latent Variable | Square root AVE > LV*<br>(Discriminant Validity > 0,5 on one LV |
| Reliability | Composite Reliability | ≥ 0,7 |
| | Cronbach's Alpha | ≥ 0,6 |

Table 5-3 shows the parameters and threshold value of each parameter used to evaluate the outer model, as Hair Jr et al. (2016) suggested. Part of the evaluation of the outer model was already done

through EFA in the previous step, such as the loading factor and Cronbach's alpha of each latent variable. The results are more or less similar, although PLS requires a higher threshold, especially for the loading factor values. Nevertheless, variables to be improved have been identified in the previous analysis.

Moreover, Hair Jr et al. (2016) also suggest that the measurement model testing, carried out through either factor or path weighting scheme, can use iteration value between 300 – 500, a stop criterion with a value of 7, and an initial weights value for all latent variables = 1.0. The results of the outer model are presented in Table 5-4.

First, we evaluate the Convergent Validity. Outer model results show that indicators having a lower loading factor value than the preferred value 0.7. In this case, we did not immediately discard the indicator but first examined the variable's AVE value. We retain the indicators for those variables with AVE value higher than 0.5. Examples of these variables are Power Asymmetry (POAS), Perceived Benefits (PEBE), and Agreement among Participants (AGPA). For Level of Technical Standardization (LTST), we had to remove four indicators: LTST5, LTST6, LTST7, and LTST8. Those indicators had low loading factor values and caused the AVE value of the LTST variable to drop below 0.5. After we discarded the indicator, the AVE of LTST became 0.547, which means it is higher than the preferred value 0.5.

Second, we evaluated Discriminant Validity which is needed because "if discriminant validity is not established, researchers cannot be certain that the results confirming hypothesized structural paths are real, or whether they are merely the result of statistical discrepancies" (Farrell, 2010, p. 324). The traditional way to assess discriminant validity is done using the Fornell-Larcker method, which considers that the value of the square root of the AVE for each variable must be greater than correlation values between variables (Fornell & Larcker, 1981). Another way to assess the discriminant validity provided by SmartPLS is using The Heterotrait-Monotrait (HTMT) ratio of correlations, and the requirements of HTMT values should be below 0.9. The Discriminant Validity values of all variables in this study can be seen in Appendix E. The appendix shows that all variables have discriminant validity according to both the Fornell-Larcker method and HTMT method.

Last, we assessed the Reliability Coefficient of all variables. The results show that all variables used in this study have both Cronbach's Alpha and Composite Reliability values above the threshold, 0.6 and 0.7, respectively. Based on the outer model analysis, it can be concluded that all variables can be considered valid and reliable to be further assessed in the inner (or structural) model analysis.

**Table 5-4 Results of Measurement Model evaluation**

| | Variable | Outer Loading | AVE | Cronbach's Alpha | Composite Reliability | R2* |
|---|---|---|---|---|---|---|
| Exogenous | Distrust to Sharing Partner (DTSP) | 0.787-0.824 | 0.655 | 0.741 | 0.851 | |
| | Power Asymmetry (POAS) | 0.633-0.886 | 0.647 | 0.716 | 0.843 | |
| | Organizational structure (INGO) | 0.743-0.836 | 0.638 | 0.714 | 0.840 | |
| | Organizational Culture (ORCU) | 0.876-0.88 | 0.771 | 0.703 | 0.871 | |
| | Organizational Readiness (ORRE) | 0.787-0.866 | 0.676 | 0.760 | 0.862 | |
| | Perceived Benefits (PEBE) | 0.695-0.83 | 0.564 | 0.806 | 0.865 | |

| | Variable | Outer Loading | AVE | Cronbach's Alpha | Composite Reliability | R2* |
|---|---|---|---|---|---|---|
| | Perceived Costs (PECO) | 0.797-0.907 | 0.729 | 0.637 | 0.842 | |
| | Organizational compatibility (ORCO) | 0.75-0.825 | 0.639 | 0.720 | 0.842 | |
| | System Quality (SYQU) | 0.866-0.883 | 0.765 | 0.693 | 0.867 | |
| | System Security (SYSE) | 0.793-0.823 | 0.655 | 0.824 | 0.884 | |
| | Technical Compatibility (TECO) | 0.881-0.912 | 0.804 | 0.757 | 0.891 | |
| | Availability of technical support (AVTS) | 0.732-0.856 | 0.639 | 0.716 | 0.841 | |
| Endogenous | Typology System (TYSY) | 0.882-0.953 | 0.843 | 0.822 | 0.915 | 4.2% |
| | Level of technical standardization (LTST)* | 0.691-0.805 | 0.547 | 0.723 | 0.828 | 36.1% |
| | Regulatory Framework (REFA) | 0.835-0.866 | 0.724 | 0.619 | 0.840 | 19.2% |
| | Decision-Making Structure (DMST) | 0.809-0.898 | 0.726 | 0.821 | 0.888 | 17% |
| | Agreement among Participants (AGPA) | 0.695-0.798 | 0.543 | 0.718 | 0.826 | 46.7% |

*only $R^2$ of the endogenous constructs are presented

### 5.5.2 Inner Model Testing

The Inner (or structural) model tells us about the relationships between exogenous and endogenous constructs. Using the bootstrapping method, the inner model evaluation is used to ensure the robustness and accuracy of the structural model. This study tested three parameters for the inner model: $R^2$, $f^2$, and $Q^2$. Bootstrapping is used to provide T-value estimates for structural path significance testing and generate data normality (Hair et al., 2019). Using bootstrapping, a number of samples are taken from the original data and then calculated for each sample resulting in a large number of estimated data for each variable in the model (Sarstedt et al., 2017). The sample size used for bootstrapping in this study was 3000; this is in accordance with the suggestion from Hair Jr et al. (2016), which states that a 500 to 5000 resampling size should be sufficient to produce consistent results.

The results of the inner model testing on the PLS are as follows:

Coefficient of determination, or $R^2$, is the proportion of the variance in an endogenous construct that can be predicted from the exogenous constructs. Values of greater than 0.670 are considered substantial, values between 0.333 to 0.670 are moderate, values between 0.190 to 0.333 are weak, and values below 0.190 are considered unsubstantial (Chin & Todd, 1995; Urbach & Ahlemann, 2010). Table 5-4 shows that $R^2$ values of AGPA and LTST can be considered moderate, R2 values of Regulatory Framework and Decision-making Structure can be considered weak, and $R^2$ values of Typology System are unsubstantial. Furthermore, evaluation of $R^2$ tells us that Organizational, Inter-organizational, and Technological factors inserted in the model can only explain the variance 4.2% of Typology System (TYSY), 36.1% of Level of Technical Standardization (LTST), 19.2% of Regulatory Framework (REFA), 17% of Decision-making Structure (DMST), and 46.7% of Agreement among Participants (AGPA).

Weak and unsubstantial $R^2$ values can have an impact on drawing conclusions for each hypothesis because they may reflect on a weak (or even no) relationship between constructs. We argue that we already selected the most important factors for the model in accordance with previous steps in this

study, and there should be no issue with the amount of data (sample data) for the PLS analysis. The potential root cause for this issue is likely the weak representation of each construct. For further research, we suggest selecting a different approach or finding better measurement indicators representing each construct.

Another parameter used to evaluate whether a construct has a substantive effect on endogenous constructs is effect size or $f^2$. This parameter evaluates the coefficient of determination value change when a predictor construct is removed from the model. The effect size values $f^2$ 0.02-0.15-0.35 each represent the small-medium-large effect of an exogenous latent construct to an endogenous latent construct. Values below 0.02 indicate that there is no effect of the predictor constructs on endogenous constructs (Sarstedt et al., 2017). Furthermore, $f^2$ values are considered as extra information about each predictor and its substantive effect on the dependent variable; evaluating the statistical significance of the predictors in explaining the dependent variables can still be done even if the f-square value is not significant or small (Sarstedt et al., 2017).

As presented in Table 5-5, none of the exogenous constructs have a moderate or large effect on any endogenous constructs. DTSP has a low effect on DMST and TYSY, PEBE has a low effect on LTST, PECO has a low effect on REFA, INGO has a low effect on AGPA, ORCO has a low effect on AGPA and REFA, ORCU has a low effect on DMST, SYSE has a low effect on LTST and REFA, SYQU has a low effect on AGPA, and TECO has a low effect on REFA. Moreover, two exogenous variables, POAS and AVTS, do not affect any endogenous constructs.

**Table 5-5 Effect size of the construct**

| f-squared | Agreement among Participants | Decision-Making Structure | Level of Technical Standardization | Regulatory Framework | Typology system |
|---|---|---|---|---|---|
| Distrust to Sharing Partner (DTSP) | 0.002 | 0.084 | 0.002 | 0.001 | 0.023 |
| Power Asymmetry (POAS) | 0 | 0 | 0.01 | 0.01 | 0.003 |
| Perceived Benefits (PEBE) | 0.014 | 0.011 | 0.02 | 0.003 | 0.006 |
| Perceived Cost (PECO) | 0.003 | 0.001 | 0 | 0.035 | 0.009 |
| Organizational structure (INGO) | 0.028 | 0.005 | 0.008 | 0 | 0.001 |
| Organizational Compatibility (ORCO) | 0.038 | 0.001 | 0.01 | 0.021 | 0.007 |
| Organizational Culture (ORCU) | 0.005 | 0.048 | 0.001 | 0.001 | 0.015 |
| Organizational Readiness (ORRE) | 0 | 0.02 | 0.016 | 0.016 | 0.012 |
| System Security (SYSE) | 0.012 | 0.005 | 0.032 | 0.035 | 0.018 |
| System Quality (SYQU) | 0.022 | 0.013 | 0.018 | 0 | 0.014 |
| Technical Compatibility (TECO) | 0.005 | 0.004 | 0 | 0.043 | 0.004 |
| Availability of Technical Support (AVTS) | 0.009 | 0.002 | 0.016 | 0 | 0.002 |

Next, the Predictive Relevance ($Q^2$) was used to measure how well the observed value is generated by the model and also the parameter estimates value. The threshold for $Q^2$ value suggested by prior research is above 0 (Wong, 2013).

Table 5-6 shows that all variables in the proposed model have predictive relevance.

**Table 5-6 Predictive Relevance of the Model**

| Variable | $Q^2$ |
|---|---|
| Agreement among Participants | 0.244 |
| Decision-Making Structure | 0.112 |
| Level of Technical Standardization | 0.177 |
| Regulatory Framework | 0.13 |
| Typology Network | 0.023 |

The inner model assessment presents some potential relationships between the exogenous constructs as predictors in explaining the endogenous constructs. For the next step, the developed hypothesis is evaluated as described in the previous section.

### 5.5.3 Hypothesis Decision

As explained before, the hypotheses were evaluated using three statistical indicators: path coefficients, p-value, and T-stat. The path coefficient has a value between -1 to +1, with coefficients close to +1 representing a strong positive relationship and coefficients closer to -1 indicating a strong negative relationship (Sarstedt et al., 2017). The p-value is used in hypothesis testing to assess whether the null hypothesis is supported or rejected. The smaller the p-value, the stronger the evidence that the null hypothesis should be rejected (Hair et al., 2006). As a rule of thumb, to support the proposed hypothesis and reject the null hypothesis, p-value ≤ 0.05 and T-Stat ≥ |1.96| should be met. The level of relationships and their direction can be found using the sample mean.

The relationship tested in the hypothesis is between the factors against the information-sharing arrangements, which in this study are characterized by the type of governance and the information-sharing system architecture, so all hypotheses are built against these two categories. In 5.1.1, it is explained that three criteria are used to represent the governance variable and two criteria for the information-sharing system architecture; this causes the evaluation of the hypothesis to be carried out on all of those five criteria. If all paths in the hypothesis are declared supported or rejected by weighing the aforementioned statistical indicators, then the hypothesis is concluded as is. However, there are cases in which there exists a path that supports and also rejects the hypothesis. In those cases the decision to be taken is partially supported.

**Table 5-7 Hypothesis Testing Results**

| Hypothesis | Path | Coeff | STDEV | T-Stat | p-value | Decision | Conclusion |
|---|---|---|---|---|---|---|---|
| H1a | DTSP --> REFA | 0.028 | 0.063 | 0.453 | 0.325 | rejected | partially supported |
| | DTSP --> AGPA | -0.041 | 0.053 | 0.782 | 0.217 | rejected | |
| | DTSP --> DMST | 0.283 | 0.067 | 4.31 | 0 | supported | |
| H1b | DTSP --> TYSY | -0.164 | 0.081 | 2.009 | 0.022 | supported | partially supported |
| | DTSP --> LTST | -0.046 | 0.062 | 0.667 | 0.252 | rejected | |
| H2a | POAS --> REFA | 0.095 | 0.064 | 1.471 | 0.071 | ** | rejected |
| | POAS --> AGPA | 0.014 | 0.052 | 0.268 | 0.394 | rejected | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | POAS --> DMST | -0.013 | 0.07 | 0.237 | 0.406 | rejected | |
| H2b | POAS --> TYSY | -0.062 | 0.086 | 0.672 | 0.251 | rejected | rejected |
| | POAS --> LTST | 0.088 | 0.056 | 1.555 | 0.06 | ** | |
| H3 | POAS --> DTSP | 0.252 | 0.078 | 3.191 | 0.001 | supported | supported |
| H4a | PEBE --> REFA | 0.061 | 0.095 | 0.643 | 0.26 | rejected | partially supported |
| | PEBE --> AGPA | 0.121 | 0.069 | 1.807 | 0.035 | supported | |
| | PEBE --> DMST | 0.128 | 0.089 | 1.412 | 0.079 | ** | |
| H4b | PEBE --> TYSY | -0.095 | 0.088 | 1.02 | 0.154 | rejected | partially supported |
| | PEBE --> LTST | 0.16 | 0.081 | 1.975 | 0.024 | supported | |
| H5a | PECO --> REFA | 0.181 | 0.069 | 2.611 | 0.005 | supported | partially supported |
| | PECO --> AGPA | 0.039 | 0.061 | 0.68 | 0.248 | rejected | |
| | PECO --> DMST | 0.023 | 0.067 | 0.486 | 0.313 | rejected | |
| H5b | PECO --> TYSY | 0.092 | 0.076 | 1.282 | 0.1 | ** | rejected |
| | PECO --> LTST | 0.013 | 0.064 | 0.195 | 0.423 | rejected | |
| H6a | ORCU --> REFA | -0.042 | 0.076 | 0.512 | 0.304 | rejected | partially supported |
| | ORCU --> AGPA | 0.074 | 0.079 | 0.941 | 0.173 | rejected | |
| | ORCU --> DMST | 0.247 | 0.078 | 3.144 | 0.001 | supported | |
| H6b | ORCU --> TYSY | -0.144 | 0.091 | 1.531 | 0.063 | ** | rejected |
| | ORCU --> LTST | -0.024 | 0.073 | 0.43 | 0.334 | rejected | |
| H7a | ORRE --> REFA | 0.154 | 0.097 | 1.585 | 0.057 | ** | rejected |
| | ORRE --> AGPA | -0.006 | 0.077 | 0.018 | 0.493 | rejected | |
| | ORRE --> DMST | -0.174 | 0.081 | 2.216 | 0.013 | supported | |
| H7b | ORRE --> TYSY | 0.149 | 0.098 | 1.567 | 0.059 | ** | rejected |
| | ORRE --> LTST | 0.136 | 0.107 | 1.312 | 0.095 | ** | |
| H8a | ORCO --> REFA | 0.178 | 0.078 | 2.285 | 0.011 | supported | partially supported |
| | ORCO --> AGPA | 0.194 | 0.07 | 2.838 | 0.002 | supported | |
| | ORCO --> DMST | -0.041 | 0.081 | 0.488 | 0.313 | rejected | |
| H8b | ORCO --> TYSY | 0.106 | 0.086 | 1.329 | 0.092 | ** | rejected |
| | ORCO --> LTST | 0.102 | 0.078 | 1.405 | 0.08 | ** | |
| H9a | INGO --> REFA | -0.011 | 0.089 | 0.195 | 0.423 | rejected | partially supported |
| | INGO --> AGPA | 0.16 | 0.065 | 2.466 | 0.007 | supported | |
| | INGO --> DMST | 0.077 | 0.086 | 0.927 | 0.177 | rejected | |
| H9b | INGO --> TYSY | -0.036 | 0.088 | 0.446 | 0.328 | rejected | rejected |
| | INGO --> LTST | -0.082 | 0.079 | 1.091 | 0.138 | rejected | |
| H10a | SYQU --> REFA | 0.011 | 0.087 | 0.163 | 0.435 | rejected | partially supported |
| | SYQU --> AGPA | 0.139 | 0.059 | 2.371 | 0.009 | supported | |
| | SYQU --> DMST | 0.13 | 0.079 | 1.659 | 0.049 | supported | |
| H10b | SYQU --> TYSY | 0.145 | 0.088 | 1.713 | 0.043 | supported | partially supported |
| | SYQU --> LTST | 0.14 | 0.088 | 1.601 | 0.055 | ** | |
| H11 | SYQU --> AVTS | 0.371 | 0.063 | 5.864 | 0 | supported | supported |
| H12a | SYSE --> REFA | 0.248 | 0.093 | 2.677 | 0.004 | supported | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | SYSE --> AGPA | 0.112 | 0.084 | 1.395 | 0.082 | ** | partially supported |
| | SYSE --> DMST | -0.103 | 0.089 | 1.09 | 0.138 | rejected | |
| H12b | SYSE --> TYSY | -0.186 | 0.094 | 2.059 | 0.02 | supported | Partially supported |
| | SYSE --> LTST | 0.211 | 0.082 | 2.593 | 0.005 | supported | |
| H13a | TECO --> REFA | -0.246 | 0.079 | 3.128 | 0.001 | supported | Partially supported |
| | TECO --> AGPA | 0.077 | 0.074 | 0.935 | 0.175 | rejected | |
| | TECO --> DMST | -0.071 | 0.081 | 0.956 | 0.169 | rejected | |
| H13b | TECO --> TYSY | 0.082 | 0.084 | 0.986 | 0.162 | rejected | rejected |
| | TECO --> LTST | 0.001 | 0.089 | 0.052 | 0.479 | rejected | |
| H14 | TECO --> AVTS | 0.279 | 0.069 | 4.06 | 0 | supported | supported |
| H15a | AVTS --> REFA | 0.025 | 0.093 | 0.21 | 0.417 | rejected | rejected |
| | AVTS --> AGPA | 0.103 | 0.067 | 1.427 | 0.077 | ** | |
| | AVTS --> DMST | 0.052 | 0.085 | 0.589 | 0.278 | rejected | |
| H15b | AVTS --> TYSY | 0.062 | 0.087 | 0.718 | 0.236 | rejected | partially supported |
| | AVTS --> LTST | 0.14 | 0.084 | 1.646 | 0.05 | supported | |
| H16 | SYSE --> DTSP | -0.26 | 0.059 | 4.321 | 0 | supported | supported |

- Blue highlight: significant level < 0.01
- Green highlight: significant level < 0.05
- Red highlight: significant level < 0.1
- Red font: opposite direction of the hypothesis

Following the results shown in Table 5-7, here is the detailed evaluation of each hypothesis:

H1a: Higher-level of distrust among participants results in the implementation of hierarchical governance.

From the three likely relationships of Distrust to Sharing Partner to the Governance of Information-Sharing, there is only one significant direct path: from Distrust to Sharing Partners (DTSP) to Decision-Making Structures (DMST). Meanwhile, the other two paths (to the Regulatory Framework and Agreement among Participants) are statistically non-significant. This hypothesis is considered partially supported according to the decision-making steps mentioned above.

Furthermore, the path coefficient value between DTSP and DMST is positive. So, DTSP positively influences DMST. In other words, higher distrust of sharing partners leads to the implementation of a consensus-based decision-making structure. This is the opposite direction of the hypothesis.

H1b: Higher-level of distrust among participants results in the implementation of a fragmented information-sharing system.

From the two likely relationships of Distrust to Sharing Partner to the Architecture of Information-Sharing system, there is only one significant direct path: from Distrust to Sharing Partners (DTSP) to Typology System (TYSY). Another path from DSTP to Level of Technical Standardization is statistically non-significant. This hypothesis is considered partially supported according to the decision-making steps mentioned above.

The path coefficient value between DTSP and TYPS is negative, meaning DTSP negatively influences TYSY. In other words, higher distrust of sharing partners results in implementing dyadic typology. This aligns with the stated hypothesis.

H2a: The existence of power asymmetry results in the implementation of a hierarchical governance structure.

Table 5-7 shows that all direct paths between Power Asymmetry (POAS) and Governance Information-Sharing are statistically non-significant. For the paths to Decision-making Structure (DMST), Regulatory Framework (REFA), and Agreement among Participants (AGPA), the p-value and the T-stat value result in the rejection of the hypothesis in favor of the null hypothesis.

In addition, regarding the path between POAS and REFA, with a significant p-value, if using 90% confidence interval levels, there is a sign that we would support the proposed hypothesis, for example, by increasing the sample size or improving the measurement indicators.

H2b: The existence of power asymmetry results in the implementation of an integrated information-sharing system.

Table 5-7 shows that all direct paths between Power Asymmetry (POAS) and Architecture of Information-Sharing System, which are marked by paths to Typology System (TYSY) and Level of Technical Standardization (LTST), are statistically non-significant. The p-value and the T-stat value results in a rejection of the hypothesis in favor of the null hypothesis.

Regarding the path between POAS and LTST, with a significant p-value, if using a 90% confidence interval, there is a sign that we would be able to support the proposed hypothesis, for example, with increasing the sample size or improving the measurement indicators.

H3: The existence of power asymmetry results in distrust of sharing partners.

Path analysis results show that a direct path from Power Asymmetry (POAS) to Distrust to Sharing Partners (DTSP) is statistically significant. According to the PLS analysis from data collected from the survey, the existence of power asymmetry leads to distrust of sharing partners.

We further analyzed whether there is an indirect path from POAS through DTSP to the Information-Sharing Arrangements. As presented in Table 5-8 there is one indirect path that is statistically significant, the path from Power Asymmetry (POAS) to Decision-Making Structure (DMST) through Distrust to Sharing Partners (DTSP). In other words, DTSP is a mediating variable for POAS in influencing information-sharing arrangements.

**Table 5-8 Indirect Paths from Power Asymmetry to Information-Sharing Arrangements through Distrust to Sharing Partners**

| Path | Coeff | STDEV | T-Stat | p-value |
|---|---|---|---|---|
| POAS → DTSP → REFA | 0.007 | 0.017 | 0.419 | 0.338 |
| POAS → DTSP → AGPA | -0.01 | 0.014 | 0.739 | 0.23 |
| POAS → DTSP → DMST | 0.072 | 0.031 | 2.336 | 0.01 |
| POAS → DTSP → TYSY | -0.041 | 0.025 | 1.632 | 0.051 |
| POAS → DTSP → LTST | -0.012 | 0.017 | 0.6 | 0.274 |

H4a: More benefits results in the implementation of network governance.

The path analysis results show that out of 3 paths from Perceived Benefits (PEBE) to the Governance of Information-Sharing variables, there is one significant direct path, e.g., from PEBE to Agreement

among Participants (AGPA). We can interpret this as, statistically, it is confirmed that perceived more benefits lead to the need to create an agreement among participants of information-sharing.

In addition, a path from PEBE to Decision-Making Structure (DMST) is close to being significant, so if we use a lower confidence level, for example 90%, the path would be considered significant. In a different population or other types of information-sharing (e.g., G2G or B2B), this path might also be significant. The path between PEBE and Regulatory Framework (REFA) is statistically non-significant. Thus, according to the decision-making steps mentioned above, this hypothesis is considered partially supported.

H4b: More benefits results in the implementation of an integrated information-sharing system.

The path analysis results show that out of two paths from Perceived Benefits (PEBE) to the Architecture of Information-Sharing Systems variables, there is one significant direct path that is from PEBE to Level of Technical Standardization (LTST). This means that the expectation to get more benefits from information-sharing leads to the implementation of the technical standardization of the information-sharing systems. Another path for this hypothesis that is from PEBE to Typology System (TYSY) is statistically non-significant. Therefore, this hypothesis is considered partially supported.

H5a: Higher perceived cost results in the implementation of hierarchical governance.

There are three (3) direct paths that are derived from this hypothesis, and as presented in Table 5-7, only the direct path from Perceived Cost (PECO) to Regulatory Framework (REFA) is found to be statistically significant. This suggests that the higher costs perceived by information-sharing participants lead to the need to mandate information-sharing.

Other paths, from PECO to Agreement among Participants (AGPA) and PECO to Decision-Making Structure (DMST), are statistically non-significant. By following the rule of thumbs in deciding hypothesis, we conclude this hypothesis is partially supported.

H5b: Higher perceived cost results in the implementation of a fragmented information-sharing system.

There is no significant direct path between the two direct paths of this hypothesis. Both Perceived Costs (PECO) to Typology System (TYSY) and Level of Technical Standardization (LTST) have p-values higher than 0.05. So, we have to reject this hypothesis in favor of the null hypothesis. In addition, the path between PECO and TYSY is close to statistically significant. If we use lower confidence level (e.g., 90%) this path becomes significant. Therefore, the proposed hypothesis might be supported (or at least partially supported) by increasing the sample size, selecting a different population, or testing other information-sharing types.

H6a: Culture of innovativeness in information-sharing participants results in the implementation of network governance.

There is only one significant direct path from Culture of Innovativeness (ORCU) to the Governance of information-sharing. This path is from ORCU to Decision-Making Structure (DMST), identified from path analysis results. This can be explained as a culture of innovativeness of information-sharing participants leads to the implementation of a participative decision-making structure. While the other two paths are evidently statistically non-significant, this hypothesis can be concluded as partially supported.

H6b: Culture of innovativeness in information-sharing participants results in the implementation of an integrated information-sharing system.

There is no significant direct path between the two direct paths of this hypothesis. Both Culture of Innovativeness (ORCU) to Typology System (TYSY) and Level of Technical Standardization (LTST) have a p-value higher than 0.05. So, we have to reject this hypothesis in favor of the null hypothesis.

In addition, the path between ORCU and TYSY is statistically significant using lower confidence level (e.g., 90%). As shown in Table 5-4, ORCU is considered a poor variable since it only consists of 2 indicators, this might be one of reasons of non-significant and less-significant results of paths related to the ORCU variable. Therefore, the proposed hypothesis might be supported (or at least partially supported) by improving the measurement indicators used in evaluate ORCU, for example, with adding other indicators to evaluate organizational innovation such as inter-departmental (or cross-functional) collaboration (Armbruster et al., 2008), organizational learning capability (Gomes & Wojahn, 2017), or R&D expenses (Usai et al., 2021).

H7a: Higher level of organizational readiness results in the implementation of network governance.

The path analysis in PLS shows that a Higher Level of Organizational Readiness (ORRE) negatively influences Decision-Making Structure (DMST). This indicates that if participants have a high-level organizational readiness, a hierarchical decision-making structure is preferable for information-sharing, or the opposite direction of stated hypothesis. The logical explanation of this result could be that with the high level of organizational readiness, clarity regarding the decision-making process is more important than the need to participate in decision-making.

The path between ORRE and Regulatory Framework (REFA) would be considered as significant using a 90% confidence level. This might be because of a poorly formed variable of REFA (as stated in Table 5-4) since it only consists of 2 indicators, which might affect the PLS evaluation related to this variable. Therefore, improving the REFA variable, for example by adding indicators to evaluate the level of strictness of regulation, might lead to a better measurement variable (Bharosa, Janssen, Klievink, et al., 2013).

Lastly, the path between ORRE and Agreement among Participants (AGPA) is evidently statistically non-significant. Taking into consideration the results of all paths, this hypothesis is rejected with additional notes regarding ORRE to DMST.

H7b: Higher level of organizational readiness results in the implementation of an integrated information-sharing system.

Both paths from ORRE to Typology System (TYSY) and Level of Technical Standardization (LTST) are statistically non-significant using a 95% confidence level. Therefore, this hypothesis is rejected in favor of the null hypothesis.

However, if we use a lower confidence level (e.g., 90%) both paths become significant. Therefore, the proposed hypothesis might be supported by increasing the sample size, selecting a different population, or testing for other types of information-sharing.

H8a: Higher level of organizational compatibility results in the implementation of network governance.

As presented in Table 5-7, out of three direct paths of this hypothesis, the paths from Organizational Compatibility (ORCO) to Regulatory Framework (REFA) and to Agreement among Participants (AGPA) are statistically significant. ORCO positively impacts both REFA and AGPA, which means that a higher

level of organizational compatibility among the participants will likely result in the implementation of mandatory information-sharing and an agreement among participants to share information. However, for the path between ORCO and REFA, the result is not in accordance with the hypothesis, which implies that ORCO should negatively impact REFA. In addition, the path from ORCO to Decision-Making Structure (DMST) is statistically non-significant.

From the three paths in this hypothesis, only 1 path is statistically significant, therefore, this hypothesis is partially supported.

H8b: Higher level of organizational compatibility results in the implementation of an integrated information-sharing system.

Similar to ORRE, both paths from ORCO to Typology System (TYSY) and Level of Technical Standardization (LTST) are statistically non-significant using a 95% confidence level. Therefore, this hypothesis is rejected in favor of the null hypothesis.

However, if we use a lower confidence level (e.g., 90%) both paths become significant. Therefore, the proposed hypothesis might be supported by increasing the sample size, selecting a different population, or testing in other types of information-sharing.

H9a: Implementation of hierarchical governance for information-sharing systems is preferred by hierarchical organizations.

There is one significant direct path from Organizational structure (INGO) to Governance of Information-Sharing, which is to Agreement among Participants (AGPA). This indicates that participants with a hierarchical Organizational structure will make efforts to make an agreement among participants for information-sharing. This does not align with the hypothesis because establishing a relational agreement in this study is assumed to be a characteristic of network governance.

The other two direct paths derived from this hypothesis: INGO to Decision-Making Structure (DMST) and to Regulatory Framework (REFA) are found to be statistically non-significant. Thus, following the rule of thumbs in making the decision of hypothesis in 5.5.3, this hypothesis is rejected with additional notes regarding INGO to AGPA.

H9b: Implementation of an integrated information-sharing system is preferred by hierarchical organizations.

There is no significant direct path for the two direct paths of this hypothesis. Both Organizational structure (INGO) to Typology System (TYSY) and Level of Technical Standardization (LTST) have a p-value higher than 0.05. So, this hypothesis is rejected.

H10a: The need for system quality results in the implementation of network governance.

From the three direct paths of this hypothesis, two paths are statistically significant, which are the paths from System Quality (SYQU) to (1) Agreement among Participants (AGPA) and (2) Decision-Making Structure (DMST). SYQU is positively impacting both AGPA and DMST, which means that the need for system quality is likely to result in agreement among participants and consensus-based decision-making structures for information-sharing.

As another path from SYQU to Regulatory Framework (REFA) is statistically non-significant. Therefore this hypothesis is partially supported.

H10b: The need for system quality results in the implementation of an integrated information-sharing system.

The path between System Quality (SYQU) and Typology System (TYSY) is statistically significant. SYQU is positively impacting TYSY, or putting into the context that the need for system quality will likely result in implementing a multilateral (hub-type) typology.

Another path between SYQU and Level of Technical Standardization (LTST) is statistically non-significant, although the p-value is 0.055, which is close to the 95% confidence level threshold. Thus, this hypothesis is partially supported.

H11: The need for system quality results in the need for technical support

Path analysis results show that a direct path from System Quality (SYQU) to Availability of Technical Support (AVTS) is statistically significant. So, according to the PLS analysis from data collected from the survey, the need for system quality leads to the need for technical support. Therefore, this hypothesis is supported.

We further analyzed whether there is an indirect path from SYQU through AVTS to the Information-Sharing Arrangements. As presented in

Table 5-9, there is no statistically significant for indirect path from SYQU to Agreement among Participants (AGPA) through AVTS.

**Table 5-9 Indirect Paths from System Quality to Information-Sharing Arrangements through Availability of Technical Support**

| Path | Coeff | STDEV | T-Stat | p-value |
|---|---|---|---|---|
| SYQU --> AVTS -> REFA | 0.01 | 0.036 | 0.203 | 0.419 |
| SYQU --> AVTS --> AGPA | 0.037 | 0.025 | 1.407 | 0.08 |
| SYQU --> AVTS -> DMST | 0.019 | 0.033 | 0.568 | 0.285 |
| SYQU --> AVTS -> TYSY | 0.023 | 0.033 | 0.692 | 0.244 |
| SYQU --> AVTS --> LTST | 0.052 | 0.033 | 1.561 | 0.059 |

H12a: The need for a secured system results in the implementation of hierarchical governance.

According to the path analysis results presented in Table 5-7, the path from System Security (SYSE) to Regulatory Framework (REFA) is statistically significant. In other words, the need for a secured system will likely result in mandatory information-sharing; this aligns with the direction of this hypothesis.

Other paths from SYSE to Agreement among Participants (AGPA) and Decision-Making Structure (DMST) are statistically non-significant. However, SYSE to AGPA is significant using a 90% confidence level; which suggests that by increasing the sample size or improving the measurement indicators, a 95% confidence level could be achieved. To conclude, this hypothesis is partially supported.

H12b: The need for a secured system results in the implementation of a fragmented information-sharing system.

According to the path analysis, the two paths from SYSE to Typology System (TYSY) and the Level of Technical Standardization (LTST) are statistically significant. SYSE has a negative impact on TYSY, or,

the need for a safe system will likely lead to the use of a dyadic (point-to-point) approach, which is in accordance with the hypothesis.

On the other hand, SYSE has a positive impact on LTST, or the need for a secured system will likely result in the adoption of data and process standardization in information-sharing. However, the hypothesis was made based on the assumption that no technical standardization is required for fragmented information-sharing. Based on the results of this path, the use of data and process standardization seems to be required in information-sharing (as also shown in the case study) and does not fit into the criteria of a fragmented information-sharing system. Thus, considering all paths, this hypothesis is partially supported.

H13a: The need for technical compatibility results in the implementation of network governance.

The path between Technical Compatibility (TECO) and Regulatory Framework (REFA) is statistically significant using p-value and T-Stat threshold. In addition, it has a negative coefficient, meaning the need for technical compatibility does not require obligatory information-sharing. This aligns with the hypothesis. However, the other two paths, TECO to Agreement among Participants (AGPA) and Decision-Making Structure (DMST) are statistically non-significant since p-value for both paths are higher than 0.05. For this hypothesis, only 1 out of 3 paths is statistically significant, therefore, this hypothesis is partially supported.

H13b: The need for technical compatibility results in implementing an integrated-information system.

Both paths from Technical Compatibility (TECO) to Typology System (TYSY) and Level of Technical Standardization (LTST) have a p-value higher than 0.05. So, we have to reject this hypothesis in favor of the null hypothesis.

H14: The need for technical compatibility results in the need for technical support.

The path analysis results show that the direct path from Technical Compatibility (TECO) to Availability of Technical Support (AVTS) is statistically significant. The PLS analysis based on the data collected from the survey shows that the need for technical compatibility will likely lead to the need for technical support.

We further analyzed whether there is an indirect path from TECO through AVTS to the Information-Sharing Arrangements. As presented in

Table 5-10, there is no statistically significant for indirect path from TECO to Information-Sharing Arrangements through AVTS.

**Table 5-10 Indirect paths from Technical Compatibility to Information-Sharing Arrangements through Availability of Technical Support**

| Path | Coeff | STDEV | T-Stat | p-value |
|---|---|---|---|---|
| TECO -> AVTS -> REFA | 0.006 | 0.027 | 0.203 | 0.42 |
| TECO -> AVTS -> AGPA | 0.029 | 0.021 | 1.252 | 0.105 |
| TECO -> AVTS -> DMST | 0.014 | 0.025 | 0.567 | 0.285 |
| TECO -> AVTS -> TYSY | 0.017 | 0.025 | 0.688 | 0.246 |
| TECO -> AVTS -> LTST | 0.039 | 0.026 | 1.486 | 0.069 |

H15a: Availability of technical support results in the implementation of network governance.

Table 5-7 shows that all direct paths between Availability of Technical Support (AVTS) and Governance Information-Sharing, which are marked by paths to Decision-making Structure (DMST), Regulatory Framework (REFA), and Agreement among Participants (AGPA), are statistically non-significant. Hence, we reject the hypothesis in favor of the null hypothesis.

In addition, the path between AVTS and AGPA is significant using a 90% confidence interval level. This indicates that we might be able to support the proposed hypothesis.

H15b: Availability of technical support results in the implementation of an integrated information-sharing system.

The path analysis results show that a direct path from Availability of Technical Support (AVTS) to Level of Technical Standardization (LTST) is statistically significant. AVTS has a positive impact on LTST, so according to the PLS analysis from data collected from the survey, the availability of technical support will likely lead to the adoption of data and process standardization in information-sharing.

On the other hand, the path between AVTS and Typology System (TYSY) is statistically non-significant. Following that, this hypothesis is partially supported.

H16: Developing a secured system results in higher levels of trust among participants.

Last, the path analysis shows that the path between Secure System (SESY) to Distrust to Sharing Partners (DTSP) is statistically significant. Therefore, this hypothesis is supported. SESY is negatively influencing DTSP, or, the need for a secure system will likely increase trust in sharing partners.

We further analyzed whether there is an indirect path from SESY to the Information-Sharing Arrangements via DTSP. As presented in Table 5-11, there are two statistically significant indirect paths from SESY to Information-Sharing Arrangements through DTSP: Decision-Making Structure (DMST) and Typology System (TYSY). In other words, DTSP is a mediating variable for SESY in influencing Information-Sharing Arrangements.

**Table 5-11 Indirect Paths from Secure System to Information-Sharing Arrangements through Distrust to Sharing Partners**

| Path | Coeff | STDEV | T-Stat | p-value |
|---|---|---|---|---|
| SESY -> DTSP -> REFA | -0.007 | 0.017 | 0.436 | 0.331 |
| SESY -> DTSP -> AGPA | 0.01 | 0.014 | 0.747 | 0.228 |
| SESY -> DTSP -> DMST | -0.074 | 0.025 | 2.963 | 0.002 |
| SESY -> DTSP -> TYSY | 0.043 | 0.024 | 1.724 | 0.042 |
| SESY -> DTSP -> LTST | 0.012 | 0.017 | 0.632 | 0.264 |

## 5.6 Conclusions from the Quantitative Analysis

This chapter analyzed which factors influence B2G information-sharing. We surveyed respondents who declared to have experience in B2G information-sharing through the online survey platform *Prolific*. Data collected from 252 respondents were analyzed in 2 stages, using exploratory factor analysis and partial least square. The first is used to find the relationship between latent structure and measurement indicators, thus forming variables (the results are presented in Table 5-4). The latter is

used to explain the relationship between latent variables and, thus form a model (the results are presented in Table 5-7 and depicted in Figure 5-11).

Figure 5-11 shows the final model of this study considering all significant paths (at least 95% confidence level) from PLS analysis. The model indicates that the information-sharing arrangements, to a significant extent, can be explained by organizational, technological, and inter-organizational factors perceived by survey respondents. 11 of the 12 factors tested in the model were statistically significant in influencing B2G information-sharing arrangements, with the exception of Power Asymmetry. Several of those factors were also identified in the literature and case studies. Furthermore, there is a difference in influence magnitude between one factor and other factors, as suggested by a higher T-value and from a number of significant paths to endogenous constructs (arrangements), which explain the dynamics and complexity of B2G information-sharing. For example, from all the paths analyzed from the model, the level of trust among partners (or in the model we call it Distrust to Sharing Partner as explained in 5.1.2.1) has the biggest influence on information-sharing arrangements, especially towards Decision-Making structure (on the governance construct). In contrast, System Quality requirements have the weakest influence on a similar path.

However, we also found some differences compared to the prior research. Some hypotheses have to be rejected in favor of the null hypothesis, and some hypotheses can be supported only by changing the direction (from positive to negative and vice versa). For the latter, there are three paths to be highlighted. First, the model suggests that higher distrust among sharing partners leads to the implementation of a consensus-based decision-making structure. At the same time, in the hypothesis, we argued that higher distrust leads to a hierarchical structure of governance. We assumed that a lack of trust would reduce the participants' involvement in the decision-making for information-sharing. However, according to the respondents, it is the opposite. Potentially, because each organization's interests might be at stake, these interests cannot be entrusted to other parties due to the high level of distrust. Thus, involvement in every decision-making process becomes critical for the organization. Second, the model suggests that high-level organizational readiness results in a hierarchical decision-making structure for information-sharing.

In the hypothesis development, we assumed that the network governance structure is compatible with more advanced information-sharing while more advanced information-sharing results in higher levels of organizational readiness (in the survey indicated by experience and resource readiness) of participants. Weiner (2009) suggested that when the level of organizational readiness is high, organizations are more likely to be involved in initiating change or innovation, exert more significant effort, exhibit greater persistence, and display more cooperative behavior. While the first indicates higher involvement, which can be considered a path toward a consensual-based decision-making structure; the other indicates that they can follow instructions or authorities, which typically occurs in a hierarchical-based decision-making structure. In that sense, survey findings might be justified. Last, the model suggests that the need for a secured system will likely result in data and process standardization adoption in information-sharing. On the other hand, the hypothesis was made by the assumption that no technical standardization is required for fragmented information-sharing. The need for a secured system indeed requires some technical standardization to ensure tracking and tracing throughout the information chain are monitored and maintained, for example, to produce an audit trail (Kishi et al., 2010; Liu & Chetal, 2005; Salim et al., 2015). Standardization in terms of authentication and authorization is also critical, for example to provide certain password

requirements, user access guidelines or to review user access periodically (Chun et al., 2013; Liu & Chetal, 2005; Salim et al., 2015).

In comparison to the case study findings, some factors identified in the case study were found statistically insignificant in the quantitative analysis, for example, power asymmetry or external pressure. In contrast, interviewees do not mention some factors which statistically significant from the quantitative analysis of the case study, for example, Organizational structure. This suggests that the situation might depend more on the context and even the stakeholder perspective since the case study merely focuses on financial reporting while respondents in the survey experience varied B2G information-sharing implementation.

Looking at the final model, the path of distrust to sharing partners to decision-making structure has the highest coefficient value. Moreover, when looking at the type of factors, the technological factors are found to be more influential, especially System Security and System Quality. Interestingly, in the case of influencing the typology system, the two are opposing each other, suggesting it is necessary to find an optimal balance between providing system security and system quality. This trade-off is recognized in the literature (Braz et al., 2007; Wolter & Reinecke, 2010). Furthermore, most organizational factors influence the governance structure of information-sharing, by either having a path to the regulatory factors, establishment of agreement among participants, or decision-making structure in the information-sharing system. For example, based on respondents in this study, perceived costs influence the regulatory factors while organizational culture influences the decision-making structure. However, the perceived benefits, according to the respondent, is influencing not only the governance structure but also the system architecture of information-sharing. Technological factors are equally influencing the governance and the architecture of information-sharing arrangements. From the inter-organizational factors, only distrust of sharing partners influences the information-sharing arrangements in architecture and governance. This variable also acts as a mediating variable of the system security and power asymmetry and influences the information-sharing arrangements.

The results can be treated as a one-to-one relationship between a factor and an element of the information-sharing arrangements, as explained in section 5.5.3: Hypothesis Decision. In addition, the findings also suggest that *combinations of factors can influence certain elements of information-sharing arrangements*. The findings imply that information-sharing arrangements depend on the situations at hand. *Obligatory* information-sharing is required when the security of information-sharing system is critical, the perceived cost is high. At the same time, some of the participants have internal systems that are incompatible with the information-sharing arrangements. In contrast, *voluntary* information-sharing can be implemented when system security is less important, costs are expected low, and the parties involved have compatible internal systems to the information-sharing system.

Then, the findings suggest that an *agreement among participants* is needed in a situation where the quality of the information-sharing system must be provided, expectations for benefits are high, with most of the involved parties implementing hierarchical governance internally and compatible organizationally. On the contrary, an agreement among participants is not needed when the system quality is less important, expectations for benefits are low, and involved parties implement less structured and less organized governance internally and incompatible organizationally.

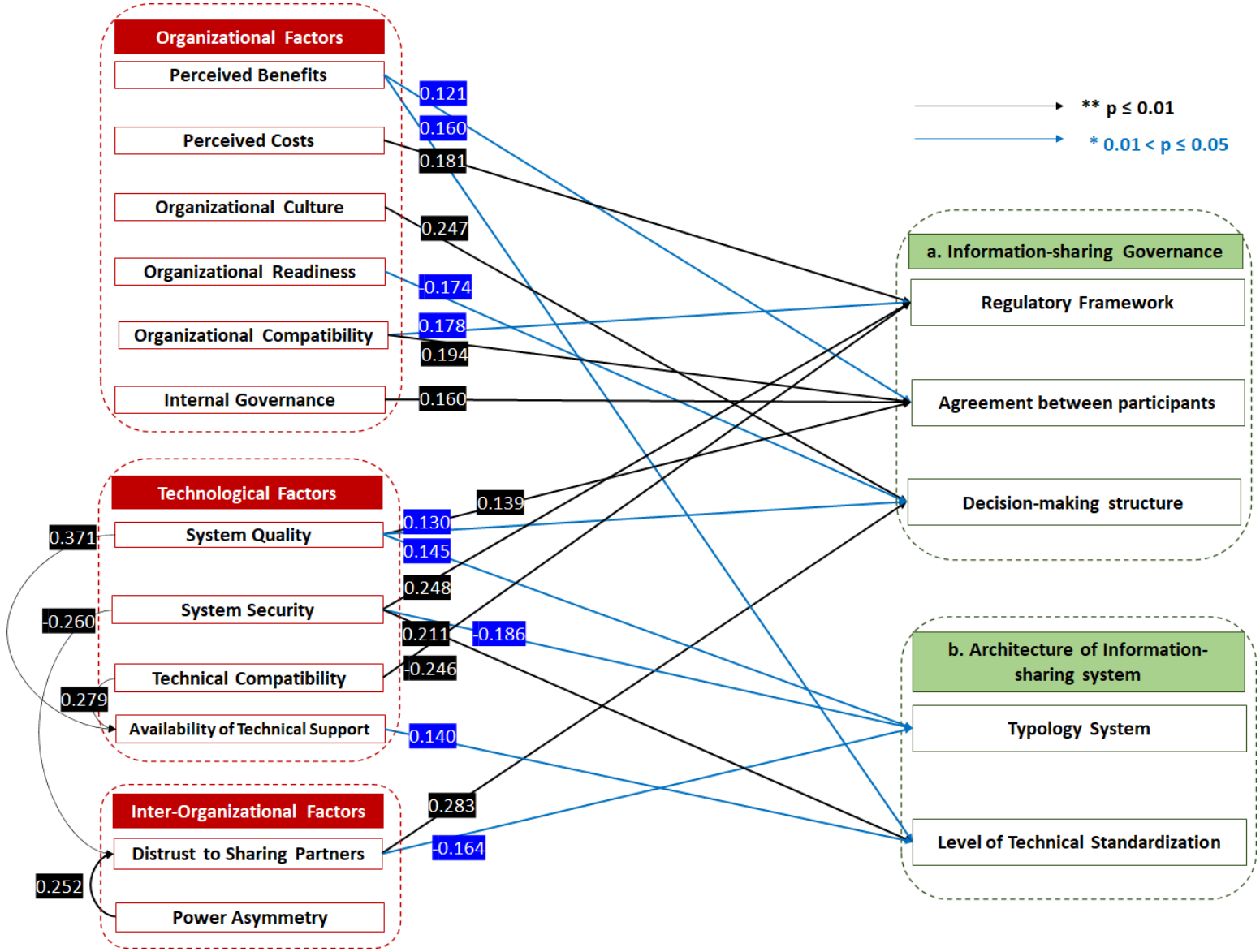


**Figure 5-11 PLS results: Final Model**

The findings also suggest that a *consensus-based* decision-making structure should be applied in situations where the level of trust among the sharing partners is low, high levels of system quality are required, and the involved parties are ready organizationally and have a culture of innovativeness. In contrast, the *hierarchical-based* decision-making structure is suitable for situations where the level of trust in the sharing partners is high, system quality is less important, involved parties are unready organizationally and there is no culture of innovativeness.

Moreover, a *multilateral typology* can be used for situations where the quality of the information-sharing system is high, there is a high level of trust in sharing partners, and system security is less important. On the other hand, a *dyadic typology* is more suitable for situations in which the system quality is less important, trust in the sharing partners is low, and the information-sharing system must be secured.

Finally, *technical standardization (including data and process standardization)* is important for situations where the information-sharing system must be secure, expectations for benefits are high, and technical support is available. In contrast, data and process standardization are less important or not needed for situations where system security is less important, the expectation of benefits is low, and technical support is unavailable.

# 6. Conclusions, Limitations, and Future Research

In this research, factors influencing businesses-to-government (B2G) information-sharing arrangements are investigated. A mixed-method research approach was applied, employing a systematic literature review, multiple case studies (conducted in two countries), and a survey. In this concluding chapter, we provide the answers to each research question, discuss the limitations, explain the practical and theoretical contributions, and provide possible directions for further research.

## 6.1 Revisiting Research Questions: Main Findings

This research aims *to understand B2G information-sharing arrangements by investigating the structure of the arrangement (in the form of system architecture and governance) and the factors that influence it.* We formulated four research questions to achieve the research objective, and in this section, we addressed the key points from each research question herafter.

**Research question 1: What are the benefits and barriers of B2G information-sharing?**

We found many benefits of B2G information-sharing in the literature ranging from less administrative burden to better compliance, as presented in Section 3.2. The benefits of B2G information-sharing were found to be different for businesses and governments. Prior studies argued that there might be an imbalance in the benefits received by participants in information-sharing, which may complicate the creation of information-sharing arrangements. This imbalance often results in B2G information-sharing bringing more perceived benefits for the governments and no or limited benefits for private organizations. Companies might even perceive information-sharing as costly and only adding to the administrative burden.

From the case studies, we also found out that some of the benefits are direct benefits and some others are indirect benefits. Direct benefits refer to benefits that can be realized directly by participants when joining information-sharing initiatives, whereas indirect or derivative benefits can only be realized after the organizations have implemented a certain information-sharing arrangement or after a direct benefit is obtained. An example is improving decision-making which can only be realized after information is shared and the information quality is improved.

The summary of B2G information-sharing benefits of this study are shown in Table 6-1, combining results from the literature review and case studies. Not all benefits are identified in the case studies. This could be that in all the cases, the stakeholders have already set the target benefits from the information-sharing at the beginning and act as the drivers or motivations to share information or join the initiative. Some benefits could be realized during the exploitation phase. For example, after collecting, combining, and analyzing the amount of data from the data providers, insights that might be overlooked before they could be obtained could be used as the inputs for decision-making for public services.

**Table 6-1 Benefits of B2G Information-sharing**

| Benefits | Type | Found in literature | | Found in a case study |
|---|---|---|---|---|
| | | For Government | For Business | |
| Improve inter-organizational collaboration | Direct | √ | √ | All cases |
| Reduce administrative burden | Indirect | | √ | SBR |
| Accelerate the processing of information | Indirect | √ | | SBR |
| Better information quality | Direct | √ | √ | SBR and AEOI |
| Better public services | Indirect | √ | | |
| Improve decision-making | Indirect | √ | | |
| Cost efficiency | Indirect | √ | √ | |
| Improve transparency | Indirect | √ | | |
| Improve accountability | Indirect | √ | √ | All cases (especially AEOI) |
| Improve compliance | Direct | √ | √ | All cases |

In the case studies, we also identified domain or case-dependent benefits. For example, information from reporting parties in AEOI can be useful as a reference and help the authorities increase the tax base, increase state revenue through taxes, and prevent tax avoidance and tax erosion. In the SBR case, companies using a highly standardized information-sharing system for multi-domain digital reporting do not need to establish point-to-point connections with the requesting parties or repeatedly submit the data. This increases efficiency whilst lowering the cost of reporting. In addition, many processes in SBR are done automatically by the information-sharing system, for example, sender authentication and validating the structure and format of the submitted reports. In this way, manual work is significantly reduced. This suggests that employees can be allocated to improve the data quality or other critical activities. These examples confirm assumptions we addressed in subsection 3.2.4, when we assumed that there are potentially more detail-level benefits that could be derived per domain or case.

Similar to the discussion about benefits, we also reviewed the challenges hindering information-sharing. The barriers range from organizational, inter-organizational to technological aspects. We then analyzed which of the barriers occurred in the investigated cases. A summary of barriers to B2G information-sharing is presented in Table 6-2. Of the many barriers identified in the literature review, only a few were found in the case studies.

**Table 6-2 Barriers of B2G information-sharing**

| Barrier name | Explanation from the case studies |
|---|---|
| Individual and organization resistance to change | Adopting XBRL requires changes to the organizational structure of Bank Indonesia, particularly the IT Department. Because actors felt that the existing methods and processes were sufficient, XBRL was only adopted for a limited scope and was not exploited further. |
| Organizational hierarchy/structure | In Indonesia, there are two agencies that have responsibilities to monitor the financial sector. In the implementation of AEOI, this emerged as a critical issue because the system has to accommodate the interests of Indonesian Tax |

| | |
|---|---|
| | Administrator (DJP) and Financial Services Agency (OJK). While developing a single system with information-sharing and collaboration between institutions would be an effective and efficient solution, due to hierarchy and bureaucracy of authority in both institutions, two applications had to be developed for each institution. |
| Lack of top-level support in organizations | In implementing LBUS, it took a long time to convince the management of Bank Indonesia (BI) to adopt XBRL. Support from BI top management is needed to enable investment in developing the system, allocating resources, and promoting its use to data providers. The half-hearted support from management limits the scope of adoption of XBRL in BI. |
| Unsure about the benefits of information-sharing | The AEOI (with its CRS) is encouraged by the OECD to be implemented in its member countries with the aim of combating tax avoidance by using information-sharing between partner countries. However, both in Indonesia and in the Netherlands, the implementation of the AEOI was more out of commitment and not because of the clarity of its benefits. Furthermore, several respondents also stated that, until this research was conducted, the authorities in each country still had difficulties processing the data received, let alone using it according to the OECD's objectives. |
| Lack of enterprise IT-architecture | An enterprise IT-architecture approach is required in developing an integrated system, especially the one that also can be utilized inter-organizationally. Lack of enterprise IT-architecture in the case study, especially the Indonesian cases, is shown by developing a new system from scratch every time a new report is needed (e.g., due to implementation of new regulations). |
| Lack of IT capability | Lack of capacity was identified mostly in cases in Indonesia. Both in the implementation of XBRL (LBUS) and the implementation of AEOI, the involved actors experienced difficulties in adopting new reporting standards due to the lack of IT capabilities. This has resulted in the applications used to support the reporting being developed as simple and easy as possible. Hence, it is difficult to develop to be more advanced; for example, to be added with more functionalities or to make more automation in the reporting processes to minimize errors because of manual work. |
| Lack of data quality | LBUS was developed by adopting XBRL as data standard. LBUS is one of many reporting applications in the Banking Reporting System owned by Indonesian Central Bank (BI). With this condition, sometimes the same data have to be reported in many applications, which means in varied formats and standards. Due to the reporting requirements, the level of granularity and the business rules for each report are also varied. This arrangement actually raises issues of data integrity and consistency. For example, similar data submitted in two different reports were inconsistent after performing a data matching analysis. Consequently, the regulator needs to do additional processes for validation and accuracy. |
| Restrictive laws and regulations | The financial sector is a domain with strict regulations, so the compliance requirements are many and detailed, and the data that must be reported is also large. This makes it difficult to design and develop a reporting system that accommodates these needs. |

The difficulty in analyzing and evaluating the challenges of sharing B2G information in the case study was due to the lack of clarity, especially regarding in which phase the challenges need to be collected. The challenges faced in each implementation phase may be different, and from the results of this study, it can be learned that it would be more beneficial if the challenges collected were divided into each implementation phase, e.g., the exploration, development, and exploitation phases.

**Research question 2: What are information-sharing arrangements?**

This question aims to provide a construction of information-sharing arrangements. From the literature review, we identified the importance of understanding information-sharing arrangements to gain benefits and overcome the obstacles faced. An information-sharing arrangement is defined as: *"the elements and relationship needed to support information-sharing among organizations"* in this research. Information-sharing arrangements are characterized by the implementation of an architecture of information-sharing system and information-sharing governance structure. The organization and interplay between inter-organizational governance and information-sharing system architecture to exchange structured data between systems were captured in this research. In an information-sharing arrangement, people, processes, and technologies of each actor play a role. The goal is to create value from the shared information for public purposes, although value can also be created for private parties.

An information-sharing architecture consists of inter-organizational relationship models, sharing standards, and other principles in realizing information-sharing objectives and strategies through IT (Janssen, 2009). The construct of a system architecture includes the elements and components of the information-sharing system. In this research, information-sharing system architecture was analyzed using 3 criteria: network typology, data management approaches, and level of integration.

Moreover, inter-organizational governance deals with decision-making procedures, roles and responsibilities of involved actors, stakeholders' engagement, and system control (Fedorowicz et al., 2015; Sambamurthy & Zmud, 1999; Weill & Ross, 2005). Since B2G information-sharing involves multiple and various organizations, the shared goals, perspectives and needs of participants, decision-making structure, and the level of participation are aspects that need to be considered in establishing a governance structure. Four criteria were used for analyzing the governance structure: type of stakeholders, type of decision-making structure, agreement among participants, and regulatory enabler.

The framework for analyzing information-sharing arrangements used in this study consists of criteria, and references to each aspect are presented in Table 3-6, Section 3.4.

The architecture and governance structure of B2G information-sharing system were analyzed in the case study. The findings show that different arrangements bring different advantages and disadvantages for both firms and government agencies. The case studies show that arranging B2G information-sharing requires understanding the context: motivations and objectives of the information-sharing, IT and organizational readiness of involved actors, as well as existing interactions or relationship between potential stakeholders. The simplest and easiest sharing mechanism are preferred in some cases. In other cases, developing an integrated system that brings in as many stakeholders as possible brings more benefits.

The need for data to be shared or reported by companies to certain government agencies is usually regulated in B2G information-sharing arrangements but can also be voluntary. Obligating firms to share information using a specific information-sharing system is found to be a strong incentive. That

way, firms have a strong incentive to share information using the information-sharing system to avoid penalties. However, it may not be enough if companies perceive the benefits will not exceed costs and risks, especially regarding their commercial interests. For this issue, other incentives could be offered, for example, by viewing information-sharing as corporate social responsibility (European-Commission, 2018). On the other hand, as shown in the SBR case study, voluntary information-sharing can pave the way for potential participants to try the information-sharing mechanism, learn how does it works, and explore potential benefits from it. Voluntary use provides flexibility, in terms of preparedness or readiness of an organization towards, for example, new mechanism, new data standards, or new technologies used to share information.

Next, due to the nature of diversity and potential stakeholders' heterogeneity, standardization is the main requirement for ensuring interoperability and scalability. With certain levels of standardization, involved actors will be able to re-use the shared data or the components of the information-sharing systems for other types of reports. The standardization is also important in developing system-to-system information-sharing, which is useful when sharing frequency and volume of data are increasing. If the information-sharing system requires adopting new technologies or data standards, providing implementation guidelines and technical support is helpful in the selected cases.

Finally, following the operationalization of information-sharing, the governance structure is very important. Most of the B2G information-sharing is initiated by the government, and in some cases the government fully funds the cost. This situation has created an asymmetry of power among stakeholders and has led to a dominant party in decision-making regarding information-sharing. This may be unsustainable and become a large burden for the government. For example, in the case of XBRL implementation, the government must continue to update the taxonomy or provide new client tools when the system is upgraded to implement a new version of XBRL or other needs. This situation may also cause the information shared to not improve in quality because the participation of the companies is only to comply with the applicable rules.

**Research question 3: Which factors influence B2G information-sharing arrangements?**

From the literature, we identified several factors influencing information-sharing, which were classified into organizational, inter-organizational, and technological factors. The organizational category includes factors that must be prepared by the organization when joining information-sharing arrangements, including resources, perceived benefits, perceived costs, perceived risks, organizational compatibilities, IT capability, and organizational experience. The inter-organizational category deals with organizational external factors related to interactions with sharing partners, including power, trust, investment methods, inter-organizational relationship, diversity of users, pressure, and shared strategies. The technological category contains shared data types, system interoperability, and compatibility. These factors are obtained from various theories and models, especially theories of technology/innovation adoption and theories that specifically discuss inter-organizational system adoption (e.g., EDI or ERP adoption across organizations) and information-sharing adoption (e.g., in e-government, supply chain, or healthcare system).

However, the factors identified in the literature are focused on the adoption perspective (e.g., factors influencing people or organizations to share their data/information). In contrast, this study investigates the factors that affect the architecture and governance of information-sharing arrangements. Although the factors can be useful as a starting point, there is a need to investigate which factors are actually influencing the architecture and governance of information-sharing.

Using data from the case studies and survey, we were able to answer this research question. Some factors identified from the literature were found to be relevant, while some factors were not mentioned by the respondents in the case study or considered not to be statistically significant from the statistical analysis based on survey data, as shown in Table 6-3 below. In total, there are 17 factors which either found in the case study or used in the model: 1) organizational factors: perceived benefits, perceived costs, organizational readiness, organizational compatibility, organizational culture, and organizational structure; 2) inter-organizational factors: external pressure, power asymmetry, level of trust to sharing partners, inter-organizational relationship, and diversity of actors; and 3) technological factors: system quality, system security, technical compatibility, interoperability, IT capability, and availability of technical support. It should be noted that not all factors identified in the case study were tested quantitatively. Based on the research method used, we do not intend to use quantitative analysis as a validator for qualitative results. The settings carried out in the two research phases were different, and the respondents were different. Instead we used inferences from qualitative and qualitative to complement each other, so even if it was not included in quantitative inferences, factors that were identified in qualitative inferences (or vice versa) were still be claimed to influence information-sharing arrangements.

**Table 6-3 Summary of Factors influencing B2G information-sharing arrangements**

| Category | Addressed Factors | From case study | From the model |
|---|---|---|---|
| Organizational | Perceived Benefits | Yes | Yes |
| | Perceived Costs | Yes | Yes |
| | Organizational Readiness | Yes | Yes |
| | Organizational Compatibility | Yes | Yes |
| | Organizational Culture | Yes | Yes |
| | Organizational Structure | | Yes |
| Inter-organizational | External Pressure | Yes | |
| | Power Asymmetry | Yes | |
| | Level of Trust to Sharing Partners | Yes | Yes |
| | Inter-organizational Relationship | Yes | |
| | Diversity of actors | Yes | |
| Technological | System Quality | Yes | Yes |
| | System Security | Yes | Yes |
| | Technical Compatibility | Yes | Yes |
| | IT Capability | Yes | |
| | Interoperability | Yes | |
| | Availability of Technical Support | Yes | Yes |

Furthermore, from the quantitative analysis, the relationships between factors were also obtained. As shown in Figure 5-11, system quality and technical compatibility requirements lead to the need for technical support for information-sharing. In addition, system security requirements and the existence of power asymmetry influence the level of distrust amojng sharing partners.

As no (considerable) dominating factor was found, there is no silver-bullet or standard formula for arranging information-sharing, although many interesting insights are gained from the survey. The

difference between the case study findings and survey suggests a major influence of path dependencies and the situations at hand. The specific context might be a huge influencing factor.

**Research question 4: Which factors (or combination of factors) influence elements of information-sharing arrangements?**

For this research question, we analyzed in more detail to show that type of architecture and governance structure used for information-sharing systems are selected based on a certain factor (or a group of factors). As shown in Figure 5-11, from all the factors in the model, only system security and system quality influence governance structure and architecture of information-sharing, while the other factors statistically influence only one of them.

Apart from that, from the quantitative analysis, the magnitude of each factor in influencing a certain element of information-sharing arrangements (both on the system architecture and on the governance structure) can also be obtained. From the elements of the governance structure, system security and technical compatibility are the most influential factors on the type of regulatory framework; organizational compatibility is the most influential factor in the need for agreement among information-sharing participants; and distrust of sharing partners are the most influential factors in choosing the type of decision-making structure in B2G information sharing. On the other hand, both elements of information-sharing system architecture (typology system and level of technical standardization) are strongly influenced by system security.

According to the model, **obligatory information-sharing** should be required for situations where the security of information-sharing system is critical. The perceived cost is high, with some participants having incompatible internal systems with the information-sharing system. In contrast, **voluntary information-sharing** can be implemented where system security is less important, costs are expected low, and involved parties have internal systems compatible with the information-sharing system.

**An agreement among participants is needed** in a situation where the quality of the information-sharing system is required, expectations for benefits are high, and most of the involved parties have implemented hierarchical governance internally and are compatible organizationally. In contrast, **an agreement among participants is less required** in a situation where the system quality is less important, expectations for benefits are low, with involved parties are implementing less structured and less organized governance internally and incompatible organizationally.

The **consensus-based** decision-making structure should be applied in a situation where the level of trust to the sharing partners is low, system quality is critical, with involved parties that are ready organizationally and have a culture of innovativeness. Contrarily, the **hierarchical-based** decision-making structure can be implemented in a situation where the level of trust between the sharing partners is high, system quality is less important, and the involved parties are organizationally unready and do not have a culture of innovativeness.

A **multilateral typology** should be implemented in a situation where the level of quality of the information-sharing system is considered high, there is a high level of trust in sharing partners, and system security is less important. On the other hand, a **dyadic typology** can be applied in a situation where the system quality is less important, trust in the sharing partners is low, and the information-sharing system must be secured.

**Data and process standardization** are required in a situation where the information-sharing system must be secured, expectations for benefits are high, and technical support is available. *Au contraire*,

data and process standardization are not needed in a situation where system security is less important, the expectations of benefits are low, and technical support is unavailable.

## 6.2 Research Contributions

This research contributes to both practical and scientific knowledge of inter-organizational information-sharing by investigating the implementation of B2G information-sharing. This study collected empirical evidence to understand B2G information-sharing arrangements and factors influencing B2G information-sharing arrangements. As summarized in the previous section, insights about architecture and governance structure used in B2G information-sharing as well as factors behind their selection were gained from qualitative and quantitative analysis. Which type of arrangements might better suit the situation was also derived. With the current implementation of public and private organizations' information-sharing, its future application is broadened. Understanding the information-sharing arrangement will be helpful not only for practitioners, the one interested in adopting or assessing the information-sharing system for other domains, but also for scholars to continuously evaluate and work in public-private information-sharing research, specifically as an IT-artefact.

From an academic viewpoint, there is plenty of work on information-sharing, but most of the work is not focused on B2G information-sharing. Furthermore, there was limited insight into factors influencing information-sharing arrangements, encompassing both system architecture and governance, from prior research. This research fills the gaps in these two aspects. This research can be considered as an intersection of the E-government and inter-organizational information systems research areas. In both areas, only a few studies have investigated the relationships between private and public organizations (Bharosa, Janssen, Klievink, et al., 2013; Klievink et al., 2012a) even though this intersection is equally important as G2C and B2C arrangements. While most of the research on those two areas has been focusing on adopting the new IT systems, the main contribution of this research is the conceptualization of information-sharing arrangements specifically in B2G context, although it may also be relevant in other areas. A conceptualization of information-sharing arrangement is done by analyzing the system architecture and governance structure of the information-sharing system that is used to share information and understand in which situations certain information-sharing arrangements are favored. The basis of this research is the assumption that understanding the arrangement of the IT system will lead to higher adoption of the system.

In addition, this study offers empirical evidence of factors influencing information-sharing arrangements. B2G has different types of information-sharing than other fields, which has to do with the nature of information-sharing. The nature is often dominated by compliance, so the factors can be specific, relevant to B2G but not to other fields. By conducting multiple case studies and developing a model through statistical analysis, not only the factors, but also insights into the magnitude of each factor influencing information-sharing arrangements is created. There are few studies addressing information-sharing from quantitative analysis, let alone mixed-method, so this research also aims to fill the gap in that specific area.

For the practical area, this research provides an understanding of how to arrange information-sharing between public and private organizations. Findings from this research can be used by policy-makers as well as project managers in the implementation of B2G information-sharing as a reference in (re)designing information systems used to facilitate inter-organizational information-sharing. With

many options for arranging information-sharing, the cases provided in this research can also be helpful to understand steps and factors that need to be considered during the development and implementation of information-sharing.

## 6.3 Research Limitations

There are three types of limitations that must be highlighted in this research. First, for the qualitative study, this research employed case studies with a limited scope. The selected cases in this study only addressed one area of B2G, namely digital financial reporting. The case study findings (the factors and the information-sharing arrangements) may not be representative of the whole field of B2G information-sharing. Moreover, data were collected from implementation in Indonesia and the Netherlands of the selected cases. Different settings and findings may be found in other countries. Although, from these cases, we can already identify various B2G information-sharing arrangements. We can also already capture insights from cases in early implementation versus matured ones, as well as Greenfield (develop from scratch) versus Brownfield (extension of the existing integrated system) approaches.

Second, as the researcher was not actively intervening in the development or implementation of the information-sharing system, observations were made through recollection of the memory and experience of experts and key people of each selected case. There may be a disparity between what actually happened and the researcher's understanding.

Third, the survey respondents consist of online “workers” provided by the selected online survey platform. We had limited control over the respondents. We could not know if each respondent put correct or proper personal information. The respondents are also financially motivated to complete the survey. Thus, there is the risk of respondents who fill in the survey carelessly or who have a bias toward the topic of this research. We have established procedures to avoid this issue, but it is hard to eliminate completely.

The explanation power of the developed model is considered low, so the findings need to be treated carefully. The low p-value of the endogenous constructs also indicates that some other factors may also influence B2G information-sharing arrangement. Respondents might be too heterogeneous and more respondents might be needed to increase the model's explanatory power. However, the question that may occur is how many more is needed to be considered enough and what if adding more respondents results in even more varied results. One of the potential solution perhaps using the same respondents between quantitative and qualitative study. Alternatively, the operationalization of each factor should also be reconsidered, evaluated, and (if necessary) improved. As this study combines several instrument variables from various previous studies, it is also possible that those instrument variables do not suitable for B2G information-sharing. On the other hand, several instrument variables have been proposed according to the context of this study, for example to measure which typology is used to share information, and additional research might be needed to ensure validity and reliability of those variables.

## 6.4 Future Research Directions

There are several potential directions for further research based on this research. First, we investigated cases about centralized information-sharing systems. With the evolution of blockchain technology, it will be interesting to explore how a more distributed information-sharing system accommodates B2G information-sharing to ensure all requirements are applied by design. Several studies (see: Belotti et al. (2019), Pedersen et al. (2019), Vigliotti and Jones (2020)) have proposed several conditions in which blockchain is required. In the context of B2G, it can be interesting to explore in which case these requirements arise. If it has been identified, a use case can be proposed (as a proof-of-concept) with the researcher participating during the use case development processes so that it becomes a longitudinal study with a limited period. This way, relevant factors (both supporting and hindering) in each development phase can be better captured. Another track is to add empirical data from the theoretical framework about blockchain adoption involving public sectors, for example, aligning with research from van Engelenburg et al. (2020), Rukanova, Ubacht, et al. (2021), Ølnes and Jansen (2021), or Tan et al. (2022).

The second research avenue is to focus on one aspect of information-sharing arrangements, for example, investigating which factors influence the adoption of network governance in supporting information-sharing. With this direction, we can more precisely differentiate between the project (transition management) governance, the architecture governance, and the IT governance of information-sharing system. By doing this, we can avoid ambiguity. The results of the descriptive analysis in this study show that there is a possibility of a relationship between the implementation of a certain arrangement on user satisfaction and user confidence. From that relationship, we can also analyze which arrangement has the greatest effect on user satisfaction and user confidence. For example, to evaluate whether the implementation of network governance positively or negatively impacts the adoption of information-sharing.

Third, we also encourage investigating B2G information-sharing in other domains, which may require different arrangements, influenced by different determinants. As financial reporting systems required the fillers to 'consciously' submit their reports and data, it should be interesting to see the information-sharing using different mechanisms, for example the data-pipeline (Rukanova et al., 2018), the data retrieval approach (Steria, 2021), real-time data sharing (Bergmann et al., 2021), and information-sharing through third parties (Agahari et al., 2021). This could include taking into consideration goal-binding policies to ensure data are being used as intended (for confidentiality and privacy purposes) or incentive models for B2G information-sharing, especially for voluntary-based arrangements.

Value creation from shared data can also be an interesting research direction. There will be more and more system-to-system information-sharing. How to ensure the integration with internal systems to create value from the shared data is critical. Since this research did not analyze how the shared data is being processed at the requesting parties, it can be valuable to explore the usage of data for value creation and how more societal benefits could be realized from the collected data.

## 6.5 Contributions to Education

Research is the gateway to providing new topics for education. The insights gathered from this research are already translated into additional topics in graduate or post-graduate courses. For example, the ICT Architecture Design course at TU Delft or IT Governance course at Telkom University has already adopted the insights of this thesis. Students were involved in theoretical and practical work about information-sharing between organizations in these courses. The discussions and findings of this research can extend the topic addressed in the mentioned courses. In this way, students are equipped with the latest insights when they start working after graduating.

Information-sharing between organizations, especially between business and government, is not straightforward, and the various options need to be educated. The topics of discussion include understanding the purpose, the context, how this initiative can create value or solutions for society, the obstacles and challenges, and how such an arrangement can be realized. The various types of information sharing can be useful for explaining and understanding the differences by students. The system architecture of B2G and governance are interrelated, and both the technical as well as social aspects need to be equally covered in education.

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# Appendices

## A. Interview

Below we provide the list of interview questions designed for this study. The interviews were performed in a semi-structured manner. Accordingly, that the exact sequence and formulation of questions partly depends on the respondent and the responses to questions during the interview.

General questions:

1. Could you tell me your name?
2. What is your role and involvement on the information-sharing?
3. What kind of information-sharing do your organization involve?
4. What kind of data being shared?
5. What is the main objective of participating in the information-sharing?
6. Could you tell us the chronology of the implementation of the information-sharing?
7. What are the lesson learned from the implementation of information-sharing?

Information-sharing Arrangements:

1. Who are key actors or stakeholders of information-sharing? Could you please elaborate their roles and responsibilities in the information-sharing?
2. What kind of information system is used for information-sharing?
3. What about the investment? Who is responsible for the cost of implementation?
4. Who is the responsible department/institution in operating and maintaining the system?
5. How does decision regarding information-sharing being made? For example in the case of changes or any operational issues?

Process-related questions:

1. Would you please describe the activities of reporting process from the data providers until the report is received by the requesting party?
2. What does the requesting party do upon receiving the data?
3. How is the data being prepared by the data providers?

Technology context questions:

1. Is the information-sharing implement any standardization? Which standard?
2. How does the system ensure the data quality?
3. How does the system ensure the safeguarding of the (private and confidential) data shared by the data providers?
4. What are the limitation and constraints regarding technology context that could influence the implementation of information-sharing from your experiences?

Organizational context questions:

1. What kind of benefits that your organization achieved after joining the information-sharing?
2. Are there any changes in the organizational structure in accommodating the implementation of the information-sharing? Is there any issues or resistances?
3. What are the limitation and constraints regarding organizational context that could influence the implementation of information-sharing from your experiences?

Inter-organizational context questions:

1. Could you describe the actors' relationship regarding information-sharing?
2. Is there any trust issues between organizations? If yes, could you elaborate it?
3. In the current status, is the information-sharing mandated by government or voluntary?
4. Related to the previous question, can you tell us the regulation(s) that mandate the data providers to share their required data?
5. Is there any sanction or reward for the data providers upon the compliance?
6. What are the limitation and constraints regarding inter-organizational context that could influence the implementation of information-sharing from your experiences?

# B. Hypotheses

**Table B-1 List of Hypothesis for Quantitative Study**

| No. | Hypothesis |
|---|---|
| H1a | Higher-level of distrust among participants results in the implementation of hierarchical governance. |
| H1b | Higher-level of distrust among participants results in the implementation of a fragmented information-sharing system. |
| H2a | The existence of power asymmetry results in the implementation of hierarchical governance structure. |
| H2b | The existence of power asymmetry results in the implementation of an integrated information-sharing system. |
| H3 | The existence of power asymmetry results in distrust among sharing partners. |
| H4a | Expectation of more benefits results in the implementation of network governance. |
| H4b | Expectation of more benefits results in the implementation of an integrated information-sharing system. |
| H5a | Higher perceived cost results in the use of hierarchical governance structure. |
| H5b | Higher perceived cost results in the use of a fragmented information-sharing system. |
| H6a | Culture of innovativeness in an organization results in the implementation of network governance. |
| H6b | Culture of innovativeness in an organization results in the implementation of an integrated information-sharing system. |
| H7a | Higher level of organizational readiness results in the implementation of network governance. |
| H7b | Higher level of organizational readiness results in the implementation of an integrated information-sharing system. |
| H8a | Higher level of organizational compatibility results in the implementation of network governance. |
| H8b | Higher level of organizational compatibility results in the implementation of an integrated information-sharing system. |
| H9a | Implementation of hierarchical governance for information-sharing systems is preferred by hierarchical organizations. |
| H9b | Implementation of an integrated information-sharing system is preferred by hierarchical organizations. |
| H10a | Requirement of system quality results in the implementation of network governance. |
| H10b | Requirement of system quality results in the implementation of an integrated information-sharing system. |
| H11 | Requirement of system quality results in the need of technical support. |
| H12a | The need for a secure system results in the implementation of hierarchical governance. |
| H12b | The need for a secure system results in the implementation of a fragmented information-sharing system. |
| H13a | The need of technical compatibility results in the implementation of network governance. |
| H13a | The need of technical compatibility results in the implementation of an integrated-information system. |
| H14 | The need of technical compatibility results in the need of technical support. |
| H15a | Availability of technical support results in the implementation of network governance. |
| H15b | Availability of technical support results in the implementation of an integrated information-sharing system. |
| H16 | Developing a secured system results in higher levels of trust among participants. |

# C. Measurement Indicators

**Table C-1 Measurement Indicators for Endogenous Constructs**

| Indicator | Code | Source |
|---|---|---|
| Information-sharing is mandated by a government regulation. | REFA_1 | (Qin & Fan, 2016) |
| Information-sharing is intended for regulatory compliance. | REFA_2 | (Qin & Fan, 2016) |
| The system ensures the shared information complies with relevant laws or regulations. | REFA_3 | (Qin & Fan, 2016) |
| Responsibilities of all users of the system are clearly defined. | AGPA_1 | (Sayogo et al., 2016) |
| I understand our organization's responsibilities in the system. | AGPA_2 | (Sayogo et al., 2016) |
| I know which user(s) is related with certain activities in the system. | AGPA_3 | (Sayogo et al., 2016) |
| There is a shared goal for the implementation of the system. | AGPA_4 | (Bajaj & Ram, 2008) |
| The shared goal(s) of the system is continuously promoted to users and potential users. | AGPA_5 | (Bajaj & Ram, 2008) |
| Decisions are made based on consensus of majority users. | DMST_1 | (Dressler, 2006; Kamal et al., 2014) |
| All users can participate to make a decision about the system. | DMST_2 | (Dressler, 2006; Kamal et al., 2014) |
| Decisions are made by a small group of decision makers (reversed). | DMST_3 | (Dressler, 2006; Kamal et al., 2014) |
| One organization dominates the decision-making process (reversed). | DMST_4 | (Dressler, 2006; Kamal et al., 2014) |
| Which network typology is used in the information-sharing system? | TYSY_1 | Made for the purpose of this study |
| The information-sharing system facilitates data sharing with more than one government agency | TYSY_2 | |
| The information-sharing system facilitates data sharing with only one government agency (reversed). | TYSY_3 | |
| Users have to validate data transactions. | LTST_1 | (Qin & Fan, 2016) |
| The system confirms when the data is received by the requester. | LTST_2 | (Qin & Fan, 2016) |
| There is a notification if there is an error in the sharing process. | LTST_3 | (Qin & Fan, 2016) |
| Each error in the system generates a unique error code. | LTST_4 | (Qin & Fan, 2016) |
| The data is submitted automatically using the information-sharing system. | LTST_5 | (Faber et al., 2017) |
| Less manual work is required in the information-sharing system. | LTST_6 | (Faber et al., 2017) |
| The information-sharing system implements a data standard. | LTST_7 | (Qin & Fan, 2016) |
| The information-sharing system implements a pre-determined data format. | LTST_8 | (Qin & Fan, 2016) |

**Table C-2 Measurement Indicators for Exogenous Construct**

| Indicator | Code | Source |
|---|---|---|
| Our sharing partner(s) sometimes changes facts slightly to get what they want. | DTSP_1 | (De Reuver, 2009; Krishnan et al., 2006; Singerling et al., 2015) |
| Our sharing partner(s) has promised to do things without actually doing it. | DTSP_2 | (De Reuver, 2009; Krishnan et al., 2006; Singerling et al., 2015) |
| Our sharing partner(s) provides us with quality information (Reversed). | DTSP_3 | (De Reuver, 2009; Krishnan et al., 2006; Singerling et al., 2015) |
| Our sharing partner(s) generally doubts the information provided by our organization. | DTSP_4 | (De Reuver, 2009; Krishnan et al., 2006; Singerling et al., 2015) |
| An organization has more power in orchestrating information-sharing. | POAS_1 | (De Reuver, 2009; Faber et al., 2017; Krishnan et al., 2006) |
| It is difficult for our organization to refuse a request from our sharing partner(s). | POAS_2 | (De Reuver, 2009; Faber et al., 2017; Krishnan et al., 2006) |
| I feel there is a stakeholder that exerts its power in deciding the rules of the information-sharing. | POAS_3 | (De Reuver, 2009; Faber et al., 2017; Krishnan et al., 2006) |
| I feel there is a stakeholder that exerts its power in deciding the standards used for information-sharing. | POAS_4 | (De Reuver, 2009; Faber et al., 2017; Krishnan et al., 2006) |
| The system reduces incorrectly shared information. | PEBE_1 | (Gil-García et al., 2007; Janssen & Tan, 2014) |
| The system makes it easier to prepare the required information to be shared. | PEBE_2 | (Janssen & Tan, 2014; Klievink et al., 2012b) |
| The system makes it easier to interpret the shared information. | PEBE_3 | (Calo et al., 2012; Janssen & Tan, 2014) |
| The system accelerates the process of sharing information. | PEBE_4 | (Klievink et al., 2012b; Prajogo & Olhager, 2012) |
| The system reduces the administrative burden in our organization. | PEBE_5 | (Janssen & Tan, 2014; Winne et al., 2011) |
| The system improves our organization's business processes. | PEBE_6 | (Lotfi et al., 2013; Van Der Meer, 2014) |
| Adopting the system is expensive. | PECO_1 | (Qin & Fan, 2016) |
| Developing the system, from initial design to operational, takes a long time | PECO_2 | (Qin & Fan, 2016) |
| Our organization has to transform the business process to adopt the information-sharing system. | PECO_3 | (Qin & Fan, 2016) |
| Our organization has a long tradition of being the first to try new methods and technologies. | ORCU_1 | (Teo & Pian, 2003) |
| Our organization encourages the employees to innovate. | ORCU_2 | (Teo & Pian, 2003) |
| Our organization has experience with the implementation of similar systems. | ORRE_1 | (Qin & Fan, 2016) |
| Our organization has experience in collaborating with the sharing partners in developing different systems. | ORRE_2 | (Qin & Fan, 2016) |
| Our organization has financial resources intended for the implementation of the information-sharing system. | ORRE_3 | (Faber et al., 2017) |
| The information-sharing system is consistent with our organization's IT strategy. | ORCO_1 | (Qin & Fan, 2016; Teo & Pian, 2003) |

| | | |
|---|---|---|
| The information-sharing system is consistent with the basic skills of employees in our organization. | ORCO_2 | (Qin & Fan, 2016; Teo & Pian, 2003) |
| The information-sharing system is consistent with our organization's beliefs and values. | ORCO_3 | (Qin & Fan, 2016; Teo & Pian, 2003) |
| Our organization standardizes organization's policies, business processes and activities. | INGO_1 | (Faber et al., 2017) |
| Our organization creates formal documents of organization's policies, business processes and activities. | INGO_2 | (Faber et al., 2017) |
| Our organization encourages exchanging data between employees and between departments. | INGO_3 | (Teo & Pian, 2003) |
| All IT decision-making authority is allocated to different lines of business, business divisions, or strategic business units (reversed). | INGO_4 | (Faber et al., 2017) |
| All IT decision-making authority in our organization in general is kept at top level of management. | INGO_5 | (Faber et al., 2017) |
| Our information-sharing system records timestamps for every action in the system. | SYQU_1 | (Su et al., 2011) |
| Our information-sharing system is composed of discrete components to ensure flexibility. | SYQU_2 | (Aagesen et al., 2011) |
| Our information-sharing system is always reliable, even in the peak time. | SYQU_3 | (Nelson et al., 2005) |
| Our information-sharing system is accessible only to those that are authorized. | SYSE_1 | (Arcieri et al., 2004; Veenstra & Ramilli, 2011) |
| Our information-sharing system ensures that every user activity can be traced uniquely to that user. | SYSE_2 | (Arcieri et al., 2004; Veenstra & Ramilli, 2011) |
| Our information-sharing system prevents unauthorized access to system or data. | SYSE_3 | (Arcieri et al., 2004; Veenstra & Ramilli, 2011) |
| Our information-sharing system requires the establishment of a secure connection. | SYSE_4 | (Arcieri et al., 2004; Veenstra & Ramilli, 2011) |
| Our information-sharing system uses open standards. | TECO_1 | (Zhu et al., 2006) |
| Our information-sharing system works properly with our organization's internal system. | TECO_2 | (Grover, 1993; Premkumar & Ramamurthy, 1995) |
| Our information-sharing system is compatible with our organization's internal system. | TECO_3 | (Grover, 1993; Premkumar & Ramamurthy, 1995) |
| In our information-sharing system, a manual is provided. | AVTS_1 | (Ahrend et al., 2014; Nelson et al., 2005) |
| In our information-sharing system, technical support is provided. | AVTS_2 | (Cresswell & Sheikh, 2013) |
| In our information-sharing system, a helpdesk is provided | AVTS_3 | (Ahrend et al., 2014; Nelson et al., 2005) |

# D. Descriptive Analysis

**Table D-1 Descriptive Analysis results of Endogenous Constructs**

| | | Regulatory Factors | | | Agreement among Participants | | | | | Decision-making Structure | | | | Topology | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | The use of information-sharing system is mandated by a government regulation. | The use of information-sharing system is intended for regulatory compliance. | The system ensures the shared information complies with relevant laws or regulations | Responsibilities of all users of the system are clearly defined | I understand our organization's responsibilities in the system | I know which user(s) has to do with certain activities in the system | There is a shared goal for the implementation of the system | The shared goal(s) of the system is continuously promoted to users and potential users | Decisions are made based on consensus of majority users | All users can participate to make a decision about the system | Decisions are made by a small group of decision makers (reversed) | One organization dominates the decision-making process (reversed) | Topology used in the information-sharing system | The information-sharing system facilitates to share data with more than one government agency . |
| N | Valid | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 2,70 | 2,85 | 2,92 | 3,06 | 3,03 | 2,77 | 2,83 | 2,75 | 2,19 | 2,00 | 1,66 | 1,78 | 2,32 | 2,04 |
| Median | | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 2,00 | 2,00 | 1,00 | 2,00 | 2,00 | 2,00 |
| Std. Deviation | | 1,011 | 0,893 | 0,831 | 0,801 | 0,805 | 0,939 | 0,806 | 0,839 | 1,134 | 1,106 | 1,094 | 0,985 | 0,858 | 1,101 |
| Variance | | 1,023 | 0,798 | 0,690 | 0,642 | 0,649 | 0,881 | 0,649 | 0,704 | 1,286 | 1,223 | 1,198 | 0,970 | 0,737 | 1,213 |

| | | Level of Standardization | | | | | | | | User Satisfaction | | | | | | User Confident | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | The information-sharing system implements a data standard | The information-sharing system implements a pre-structured data format | Users have to validate data transactions. | The system confirms when the data is received by the requester. | There is a notification if there is an error in the sharing process. | Each error in the system generates a unique error code. | The data is submitted automatically in the information-sharing system | Less manual works are required in the information-sharing system | I am satisfied with how the decision made in the system | I am satisfied with the infrastructure of the system | I am satisfied with the quality of the shared data | I am satisfied with sharing mechanisms used in the system | Our organization plans to keep using the system | I want to encourage my business partners to use the information-sharing system | I feel safe to share information using the information-sharing system | I trust the information-sharing system | I believe the data that I share using the information-sharing system is not leaked | I believe I am using a reliable system to share information with my partner(s) |
| N | Valid | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 2,93 | 2,86 | 2,68 | 2,82 | 2,85 | 2,62 | 2,61 | 1,98 | 2,86 | 2,84 | 2,88 | 2,87 | 2,96 | 2,74 | 2,90 | 2,88 | 2,81 | 2,98 |
| Median | | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 |
| Std. Deviation | | 0,800 | 0,833 | 0,983 | 0,980 | 0,984 | 1,078 | 1,119 | 0,990 | 0,770 | 0,782 | 0,822 | 0,797 | 0,785 | 0,861 | 0,813 | 0,817 | 0,906 | 0,793 |
| Variance | | 0,640 | 0,694 | 0,967 | 0,960 | 0,968 | 1,162 | 1,251 | 0,980 | 0,593 | 0,612 | 0,676 | 0,635 | 0,616 | 0,742 | 0,660 | 0,668 | 0,822 | 0,629 |

# E. Discriminant Validity

**Table E-1 Discriminant Validity results**

| Fornell-Locker Table | Agreement among Participants | Availability of Technical Support | Technical Compatibility | Decision-Making Structure | Distrust to Sharing Partner | Organizational structure | Level of Technical Standardization | Organizational Compatibility | Organizational Culture | Organizational Readiness | Perceived Benefits | Perceived Cost | Power Asymmetry | Regulatory Framework | System Security | Technical Requirements | Typology System |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agreement among Participants | 0.737 | | | | | | | | | | | | | | | | |
| Availability of Technical Support | 0.496 | 0.799 | | | | | | | | | | | | | | | |
| Technical Compatibility | 0.49 | 0.43 | 0.897 | | | | | | | | | | | | | | |
| Decision-Making Structure | 0.05 | 0.099 | -0.016 | 0.852 | | | | | | | | | | | | | |
| Distrust to Sharing Partner | -0.106 | -0.014 | -0.153 | 0.342 | 0.81 | | | | | | | | | | | | |
| Organizational structure | 0.515 | 0.454 | 0.428 | 0.144 | -0.042 | 0.798 | | | | | | | | | | | |
| Level of Technical Standardization | 0.456 | 0.469 | 0.399 | 0.05 | -0.097 | 0.305 | 0.74 | | | | | | | | | | |
| Organizational Compatibility | 0.555 | 0.454 | 0.518 | 0.035 | -0.16 | 0.467 | 0.432 | 0.8 | | | | | | | | | |
| Organizational Culture | 0.346 | 0.321 | 0.346 | 0.264 | 0.122 | 0.392 | 0.218 | 0.333 | 0.878 | | | | | | | | |
| Organizational Readiness | 0.427 | 0.475 | 0.516 | 0.037 | -0.035 | 0.463 | 0.405 | 0.411 | 0.56 | 0.822 | | | | | | | |
| Perceived Benefits | 0.53 | 0.433 | 0.53 | 0.118 | -0.073 | 0.474 | 0.456 | 0.608 | 0.33 | 0.445 | 0.751 | | | | | | |
| Perceived Cost | 0.243 | 0.273 | 0.177 | 0.143 | 0.179 | 0.241 | 0.197 | 0.173 | 0.212 | 0.238 | 0.241 | 0.854 | | | | | |
| Power Asymmetry | 0.123 | 0.158 | 0.098 | 0.108 | 0.266 | 0.146 | 0.163 | 0.093 | 0.111 | 0.117 | 0.081 | 0.215 | 0.805 | | | | |
| Regulatory Framework | 0.311 | 0.287 | 0.121 | -0.008 | 0.033 | 0.214 | 0.249 | 0.296 | 0.138 | 0.263 | 0.273 | 0.294 | 0.176 | 0.851 | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System Security | 0.529 | 0.583 | 0.549 | -0.03 | -0.193 | 0.404 | 0.53 | 0.477 | 0.176 | 0.407 | 0.507 | 0.221 | 0.089 | 0.339 | 0.809 | | |
| Technical Requirements | 0.501 | 0.484 | 0.411 | 0.136 | -0.045 | 0.448 | 0.455 | 0.39 | 0.307 | 0.415 | 0.404 | 0.223 | 0.177 | 0.26 | 0.585 | 0.874 | |
| Typology System | 0.092 | 0.079 | 0.106 | -0.158 | -0.172 | 0.039 | 0.027 | 0.109 | -0.028 | 0.117 | 0.022 | 0.065 | -0.059 | -0.066 | 0.035 | 0.113 | 0.918 |

# F. Path Analysis

**Table F-1 Complete Path Analysis results**

| Path Coefficient | Original Sample | Sample Mean | Standard Deviation | T-Stat | P-Values |
|---|---|---|---|---|---|
| Availability of Technical Support -> Availability of Agreement | 0.092 | 0.096 | 0.068 | 1.352 | 0.088 |
| Availability of Technical Support -> Decision-Making Structure | 0.051 | 0.052 | 0.086 | 0.597 | 0.275 |
| Availability of Technical Support -> Level of Standardization | 0.135 | 0.138 | 0.086 | 1.567 | 0.059 |
| Availability of Technical Support -> Regulatory Framework | 0.018 | 0.019 | 0.098 | 0.187 | 0.426 |
| Availability of Technical Support -> Typology system | 0.058 | 0.061 | 0.087 | 0.664 | 0.253 |
| Compatibility -> Availability of Agreement | 0.068 | 0.076 | 0.074 | 0.93 | 0.176 |
| Compatibility -> Availability of Technical Support | 0.278 | 0.278 | 0.069 | 4.029 | 0 |
| Compatibility -> Decision-Making Structure | -0.078 | -0.077 | 0.08 | 0.977 | 0.164 |
| Compatibility -> Level of Standardization | -0.005 | -0.003 | 0.09 | 0.058 | 0.477 |
| Compatibility -> Perceived Cost | 0.062 | 0.063 | 0.077 | 0.805 | 0.21 |
| Compatibility -> Regulatory Framework | -0.25 | -0.247 | 0.077 | 3.233 | 0.001 |
| Compatibility -> Typology system | 0.084 | 0.081 | 0.082 | 1.022 | 0.154 |
| Distrust to Sharing Partner -> Availability of Agreement | -0.039 | -0.038 | 0.054 | 0.727 | 0.234 |
| Distrust to Sharing Partner -> Decision-Making Structure | 0.287 | 0.283 | 0.067 | 4.261 | 0 |
| Distrust to Sharing Partner -> Level of Standardization | -0.039 | -0.044 | 0.062 | 0.637 | 0.262 |
| Distrust to Sharing Partner -> Regulatory Framework | 0.029 | 0.028 | 0.063 | 0.458 | 0.324 |
| Distrust to Sharing Partner -> Typology system | -0.16 | -0.167 | 0.084 | 1.919 | 0.028 |
| Organizational structure -> Availability of Agreement | 0.153 | 0.156 | 0.067 | 2.284 | 0.011 |
| Organizational structure -> Decision-Making Structure | 0.081 | 0.084 | 0.081 | 1.005 | 0.158 |
| Organizational structure -> Level of Standardization | -0.091 | -0.085 | 0.078 | 1.175 | 0.12 |
| Organizational structure -> Regulatory Framework | -0.019 | -0.017 | 0.087 | 0.22 | 0.413 |
| Organizational structure -> Typology system | -0.046 | -0.044 | 0.088 | 0.52 | 0.301 |
| Organizational Compatibility -> Availability of Agreement | 0.193 | 0.19 | 0.068 | 2.822 | 0.002 |

| | | | | | |
|---|---|---|---|---|---|
| Organizational Compatibility -> Decision-Making Structure | -0.039 | -0.041 | 0.081 | 0.481 | 0.315 |
| Organizational Compatibility -> Level of Standardization | 0.106 | 0.1 | 0.077 | 1.374 | 0.085 |
| Organizational Compatibility -> Regulatory Framework | 0.177 | 0.176 | 0.08 | 2.204 | 0.014 |
| Organizational Compatibility -> Typology system | 0.108 | 0.1 | 0.084 | 1.289 | 0.099 |
| Organizational Culture -> Availability of Agreement | 0.067 | 0.067 | 0.077 | 0.871 | 0.192 |
| Organizational Culture -> Decision-Making Structure | 0.248 | 0.252 | 0.077 | 3.238 | 0.001 |
| Organizational Culture -> Level of Standardization | -0.037 | -0.031 | 0.071 | 0.529 | 0.298 |
| Organizational Culture -> Regulatory Framework | -0.041 | -0.043 | 0.074 | 0.551 | 0.291 |
| Organizational Culture -> Typology system | -0.148 | -0.148 | 0.091 | 1.635 | 0.051 |
| Organizational Readiness -> Availability of Agreement | -0.009 | -0.01 | 0.074 | 0.121 | 0.452 |
| Organizational Readiness -> Decision-Making Structure | -0.176 | -0.173 | 0.081 | 2.18 | 0.015 |
| Organizational Readiness -> Level of Standardization | 0.136 | 0.133 | 0.103 | 1.318 | 0.094 |
| Organizational Readiness -> Regulatory Framework | 0.154 | 0.157 | 0.093 | 1.66 | 0.049 |
| Organizational Readiness -> Typology system | 0.144 | 0.141 | 0.096 | 1.505 | 0.066 |
| Perceived Benefits -> Availability of Agreement | 0.116 | 0.116 | 0.066 | 1.755 | 0.04 |
| Perceived Benefits -> Decision-Making Structure | 0.13 | 0.13 | 0.084 | 1.546 | 0.061 |
| Perceived Benefits -> Level of Standardization | 0.154 | 0.154 | 0.081 | 1.904 | 0.028 |
| Perceived Benefits -> Regulatory Framework | 0.066 | 0.069 | 0.094 | 0.7 | 0.242 |
| Perceived Benefits -> Typology system | -0.101 | -0.103 | 0.085 | 1.196 | 0.116 |
| Perceived Cost -> Availability of Agreement | 0.043 | 0.04 | 0.063 | 0.679 | 0.249 |
| Perceived Cost -> Decision-Making Structure | 0.032 | 0.025 | 0.067 | 0.479 | 0.316 |
| Perceived Cost -> Distrust to Sharing Partner | 0.182 | 0.184 | 0.065 | 2.822 | 0.002 |
| Perceived Cost -> Level of Standardization | 0.013 | 0.015 | 0.065 | 0.208 | 0.418 |
| Perceived Cost -> Regulatory Framework | 0.18 | 0.177 | 0.068 | 2.632 | 0.004 |
| Perceived Cost -> Typology system | 0.098 | 0.091 | 0.076 | 1.28 | 0.1 |
| Power Asymmetry -> Availability of Agreement | 0.011 | 0.012 | 0.051 | 0.212 | 0.416 |
| Power Asymmetry -> Decision-Making Structure | -0.016 | -0.015 | 0.068 | 0.231 | 0.409 |
| Power Asymmetry -> Distrust to Sharing Partner | 0.25 | 0.249 | 0.076 | 3.269 | 0.001 |
| Power Asymmetry -> Level of Standardization | 0.085 | 0.086 | 0.053 | 1.59 | 0.056 |

| | | | | | |
|---|---|---|---|---|---|
| Power Asymmetry -> Regulatory Framework | 0.094 | 0.094 | 0.067 | 1.416 | 0.078 |
| Power Asymmetry -> Typology system | -0.06 | -0.061 | 0.087 | 0.696 | 0.243 |
| Security -> Availability of Agreement | 0.118 | 0.115 | 0.085 | 1.38 | 0.084 |
| Security -> Decision-Making Structure | -0.098 | -0.098 | 0.088 | 1.109 | 0.134 |
| Security -> Distrust to Sharing Partner | -0.256 | -0.261 | 0.06 | 4.302 | 0 |
| Security -> Level of Standardization | 0.214 | 0.212 | 0.083 | 2.565 | 0.005 |
| Security -> Perceived Cost | 0.109 | 0.107 | 0.084 | 1.294 | 0.098 |
| Security -> Regulatory Framework | 0.249 | 0.249 | 0.093 | 2.688 | 0.004 |
| Security -> Typology system | -0.193 | -0.186 | 0.093 | 2.087 | 0.019 |
| System Quality -> Availability of Agreement | 0.139 | 0.136 | 0.061 | 2.284 | 0.011 |
| System Quality -> Availability of Technical Support | 0.369 | 0.372 | 0.064 | 5.748 | 0 |
| System Quality -> Decision-Making Structure | 0.132 | 0.127 | 0.08 | 1.649 | 0.05 |
| System Quality -> Level of Standardization | 0.14 | 0.136 | 0.087 | 1.61 | 0.054 |
| System Quality -> Perceived Cost | 0.133 | 0.137 | 0.078 | 1.703 | 0.044 |
| System Quality -> Regulatory Framework | 0.014 | 0.012 | 0.084 | 0.162 | 0.436 |
| System Quality -> Typology system | 0.149 | 0.143 | 0.089 | 1.666 | 0.048 |

# Summary

Business-to-government (B2G) information sharing has the potential to bring many benefits to governments and companies. Because of the urgent need to improve public services and increase the adoption of cutting-edge technology in public organizations, collaboration between private and public organizations is promoted, thus, more information is shared between the two parties.

There are many different ways to share information. Prior studies show there are many approaches to arranging inter-organizational information-sharing, based on technological requirements, organizational, and inter-organizational characteristics. Each arrangement may have its advantages and disadvantages. Yet which arrangement is appropriate is given less attention. The purpose of this study is: *"to understand business-to-government (B2G) information-sharing arrangements by investigating the structure of the arrangements, in the form of system architecture and governance, and the factors that influence the arrangements".* We argue that by understanding the arrangements and factors influencing them, B2G information-sharing actors can select the most suitable arrangements and potentially increase the adoption of information-sharing initiatives. Therefore, it is necessary to understand information-sharing arrangements in order to design and implement B2G information-sharing.

From the research objective, we developed four research questions. These questions reflect the research steps or phases, as follows:

1. What are the benefits and barriers of B2G information-sharing?
2. What are the elements of information-sharing arrangements?
3. Which factors influence B2G information-sharing arrangements?
4. Which factors (or combination of factors) influence elements of information-sharing arrangements?

This study used mixed-method research to answer those questions. The first and second questions were addressed using a structured literature review (SLR). The third and fourth questions were addressed using a combination of qualitative and quantitative studies. Prior studies provide a varied range of definitions of inter-organizational information-sharing. Then, from provided definitions, we specify the definitions for the scope of this study which is B2G. The drivers of B2G information-sharing were also collected from prior studies, including for compliance purposes, supporting administrative tasks, and policy development. Furthermore, prior studies have also already identified the benefits and challenges of B2G information-sharing. Improving collaboration, reducing administrative burden, accelerating the processing of information, improving information quality, improving public services, improving accountability, improving decision-making, cost efficiency, improving transparency, and improving compliance were the benefits that are felt by participants from the implementation of B2G information-sharing according to prior studies. From the prior studies, we also learned about elements of information-sharing arrangements, which are system architectures and governance structures. From the system architecture, information-sharing can be arranged differently based on the network typology, data management approach, and level of integration. On the other hand, from the governance structure, information-sharing can be characterized by regulatory enabler, the type of decision-making structure, agreement among participants, and the type of stakeholders involved in the information-sharing.

In the qualitative part, this study investigated cross-sectional multiple case studies in the implementation of B2G information-sharing. The investigated cases were the implementation of information-sharing systems between public and private organizations in the financial reporting area, including two cases in the implementation of eXtensible Business Reporting Language (XBRL) as data standard in financial reporting and two cases in the implementation of Automatic Exchange of Information (AEOI). Primary data were collected from 16 respondents through semi-structured interviews and group discussions. Data were combined with secondary data collected mainly from presentations (e.g., slides and videos) and official documents (e.g., guidelines and reports).

XBRL is an XML-based software language which is developed as a new and standardized approach to simplify the way organizations prepare, validate, consume and analyze financial data. XBRL emerged as a solution for problems in the management and audit process of financial data. AEOI is a standard that supports the information-sharing of taxpayer accounts between countries at a certain time periodically, systematically, and continuously from "the source country" where individuals or groups of individuals have assets, do businesses, or save their wealth with "the home country" of those people or entities.

The case study shows that B2G information-sharing can be arranged in many ways, varied in system architecture and governance structure. From the case study, we also complement the benefits and challenges addressed by prior studies, showing which benefits were identified in the cases. Selecting a particular system architecture and governance structure for an information-sharing system can be considered as an approach to overcoming the barriers encountered in order to realizing the expected benefits of information-sharing. The results of the qualitative study also show a potential relationship between organizational, inter-organizational, and technological factors with the type of B2G information-sharing arrangements.

For the quantitative study, we proposed a model and developed 28 hypotheses to evaluate the causal relationship between factors (as causal variables) and type of arrangements (as effect predicted). In total, there were 12 factors used in the model: 1) organizational factors: perceived benefits, perceived costs, organizational readiness, organizational compatibility, organizational culture, and Organizational structure; 2) inter-organizational factors: external pressure, level of trust in sharing partners, inter-organizational relationship, and diversity of users; and 3) technological factors: system quality, system security, technical compatibility, interoperability, IT capability, and availability of technical support. In addition, there were five information-sharing arrangements variables used in the model; three variables of governance structure: regulatory enabler, agreement among participants, and decision-making structure, and two variables of system architecture: typology network and level of technical standardization. Two statistical analyses were used in this qualitative study: Exploratory Factor Analysis (EFA) which used to evaluate the measurement indicators of each variable, and Partial Least Square (PLS) which used for hypothesis and model testing.

Combining results from the qualitative and quantitative study, ten factors: perceived benefits, perceived costs, organizational readiness, organizational compatibility, organizational culture, level of trust to sharing partners, system quality, system security, technical compatibility, and availability of technical support were influencing information-sharing arrangements in both studies. In addition, organizational structure, external pressure, power asymmetry, inter-organizational relationship, diversity of actors, IT capability, and interoperability were only influencing information-sharing arrangements in one study, case study, or survey.

This research contributes to the information-sharing literature by adding insights related to the implementation of B2G information-sharing. There are three main contributions of this study, first, this study proposes a concept of information-sharing arrangements. Second, this study proposes dimensions of the arrangements: system architecture and governance structure, including criteria of each dimension. Last, using the criteria as an analytical lens, this study evaluates factors influencing the selection of system architecture and governance structure used in B2G information-sharing.

Apart from the contributions, there are research limitations that can be highlighted from this study. First, this study only examines the implementation of the financial reporting system in the Netherlands and Indonesia. The results obtained may be different if this study was conducted at different locations and with different types of information-sharing. Second, there are several variables in quantitative research that were poorly formed, which causes low explanatory power of endogenous variables. Therefore, the interpretation of the quantitative study should be carried out cautiously.

There are several avenues proposed for further research. First, we encourage investigating B2G information-sharing in other domains, which may require different arrangements and be influence by different determinants. Second, it is also interesting to investigate how the distributed system (such as blockchain) accommodates B2G information-sharing to ensure all requirements are applied by design. Third, considering this research's limitations, we suggest focusing on one aspect of information-sharing arrangements, for example, the governance structure and added impact variables. By this design, for example, we can seek and evaluate if the implementation of network governance have impact to the adoption of information-sharing.

Lastly, as research can be considered as the gateway to provide new topics for the education, findings of this research can be used to extend the discussion in the graduate or post-graduate courses. Discussion about B2G information-sharing (including benefits, and challenges), type of arrangements, and factors influencing information-sharing arrangements can be a trigger for the emergence of fresh ideas and solutions, especially to improve public services.

# Curriculum Vitae

Dhata Praditya was born in Manado, North Sulawesi, Indonesia on 14 December 1983. He studied Electrical Engineering with specialization in telecommunication for his bachelor degree and master degree, both at School of Electrical Engineering and Informatics, Bandung Institute of Technology. He received his bachelor degree on March 2006 with final project focusing on Traffic Analysis of Next Generation Network. He graduated as a master engineering on 2008, his master thesis entitled "Designing Network Layer of Wireless Sensor Network for Agriculture Application". He is currently married with 2 daughters.

Since 2009, Dhata has been working for PT. Telkom Indonesia tbk (Telkom). He had experiences in various fields of work. He started his career as Switching Engineer and then, Network Optimization Engineer in CDMA division, Telkom. After that, he moved to Telkom Access, a subsidiary of Telkom engaged in deploying optical fiber infrastructure, as a business development officer. Then, he acted as a Project Manager for WIFI Deployment. He had responsibility for WIFI deployment projects in Jakarta, North Sumatra, West Sumatra, and Central Java.

In 2013 he was awarded a Ph.D. Scholarship from the company as part of the Employee Development Program. Since September 2014, he has been working with his Ph.D. program at Information and Communication Technology (ICT) section, Department of Engineering Systems and Services (ESS), the Faculty of Technology, Policy, and Management (TPM), Delft University of Technology, the Netherlands. His Ph.D. research focusses on business-to-government information-sharing, to analyze system architecture and governance structure in information-sharing and understanding factors that influencing the arrangements.

Currently, apart from working as an employee at Telkom Indonesia (in the sub directorate Performance and Management, Network and IT Services), Dhata is also assigned as a professional lecturer at Telkom University, a private university owned by the Telkom Education Foundation (*Yayasan Pendidikan* Telkom). He is a member of the Architecture and Systems Governance group, Department of Information Systems, School of Industrial Engineering. After his Ph.D., he aims to explore more in his expertise and specialization, to bring academic values to companies as well as practical insights to his students, and to have quality publications.

List of Publications based on this research:

1) Kurnia, R.A., Praditya, D., & Janssen, M. (2019). A Comparative Study of Business-to-Government Information-sharing Arrangements for Tax Reporting. International Working Conference on Transfer and Diffusion of IT.
2) Praditya, D., & Janssen, M. (2017). Assessment of factors influencing information-sharing arrangements using the best-worst method. Conference on e-Business, e-Services and e-Society.
3) Praditya, D., Janssen, M., Sulastri, R. (2017). Determinants of Business-to-Government Information-sharing Arrangements. Electronic Journal of E-Government.
4) Praditya, D., Sulastri, R., Bharosa, N., Janssen, M. (2016). Exploring XBRL-Based Reporting System: A Conceptual Framework for System Adoption and Implementation, Conference on e-Business, e-Services and e-Society.

5) Praditya, D., & Janssen, M. (2016). Factors Influencing the Creation of Information-sharing Arrangements between Private and Public Organizations. ECEG2016-Proceedings of 16th European Conference on e-Government.
6) Praditya, D., & Janssen, M. (2015). Benefits and challenges in information-sharing between the public and private sectors. Academic Conferences Limited.


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