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Challenges of Service-Oriented Architecture (SOA)

- From the public sector perspective

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Abstract

The Swedish government started its initiative for electronic services (e-services) in 2005 to create the infrastructure for information management, optimize the government, and potentially save tax money. The technological paradigm Service-Oriented Architecture (SOA) was adopted to facilitate the Swedish government's initiative. The purpose of SOA is to increase efficiency for developing e-services. Nonetheless, several challenges remain with SOA implementations and there is little research exploring the challenges faced by the public sector specifically. This thesis aims to highlight the challenges faced by the public sector when implementing SOA. The authors conducted a semi-structured interview study involving four IT Architects working closely with SOA development. Moreover, the authors reviewed the literature to identify the SOA challenges and to create a theoretical framework to support the validity of the empirical findings.

Results & Conclusion

The empirical findings reveal 13 challenges met by the public sector. They are real-time communication, service cooperation, testing, reliability, security, legacy software migration, legacy migration cost estimation, SOA governance, vendor software customization, Organizational change, slow IT adoption, lack of strategy, and SOA owners. The most commonly reported challenge is SOA governance. This challenge is associated with the lack of technological understanding by the management, as well as with the caution about adopting new technologies. Three of the identified challenges were not found in the literature review. They were slow IT adoption, lack of strategy, and difficulties in finding SOA owners.

Table of Content

LIST OF FIGURES

List of Tables

LIST OF ABBREVIATIONS

API	Application Programming Interface
CORBA	Common Object Request Broker Architecture
COM	Component Object Model
MS DCOM	Microsoft Distributed Component Object Model
OOP	Object-Oriented Programming
SOA	Service-Oriented Architecture
SOA MM	Service-Oriented Architecture Maturity Model
WSDL	Web Services Description Language

LIST OF TERMS

Service	Distinct functionality with clear purpose of existence
Electronic (E) Service	Electronic, distinct functionality with clear purpose of existence
Service-Component	Encapsulates the service to provide a common interface
Web service	Service which publicly exposes logic with a technical contract
Self-contained	Service which has all it may require to function
Black-box service	Service with hidden implementation logic for the user
Service lifecycle	Steps through which a service goes from its invention to its retirement
(Enterprise) Service Bus	Software designed to control and route service messages
Business Process Modeling	Activity to represent a process as a service
Integration Competency Center	Center for methodical data integration

1 Introduction

With the popularity of electronic services (e-services) and the growth of the Internet, the Swedish government initiated investment plans in 2003 (Regeringen, 2003) to improve information management in the Internet Age. These "e-services" are intended to create new and efficient means of communication between the public sector and citizens, organizations and other governmental bodies, and to open up new ways of doing business. They are also intended to offer common services on the Internet by creating useful packages of information at the right time, in the right place, and for the right consumer (Regeringen, 2005).

The e-services create a network of infrastructure; a more technical conceptualization of "service" is provided by Stojanovic, Dahanayake, and Sol (2004). The authors explain that a service is a *distinct functionality* with a clear purpose and is created from one specific organizational requirement, such as the online tax declaration. Overall, the e-services create a bond between all citizens, even encompassing all of the people on the planet with Internet access, whereby everyone is constantly connected, both to the government and to other citizens. Thus, communication between the government and the citizens becomes more geographically independent. Andréasson (2011) refers to this as an "information society", in which society is characterized by the advanced use of IT technologies. Such technological infrastructure creates new ways of communicating between a government and its citizens.

1.1 Importance of SOA

Both Europe eGovernment (2011) and the Swedish government (Regeringen, 2014) regard the development of e-services as a potential replacement for some government functions (Nygren, 2009). In order to increase efficiency and productivity, and potentially save money on routine tasks, government functions can be recreated as automatic e-services. Nygren (2009) emphasizes that there is a great focus, both from the public and the government, on initiatives behind these electronic services. The intention is far-reaching as the aim is not only to optimize the current government, but also to attract new voters.

For e-service creation to succeed, researchers such as Arsanjani (2004) suggest using architecture, specifically Service-Oriented Architecture (SOA). Erl (2005) conceptualized the SOA in the Journal of Information and Computer Science. Erl gives SOA the definition of a paradigm, which standardizes the development of reusable, open, and vendor independent services. By this definition, SOA promises to solve the challenges that arise while creating services (Bennett et al., 2000). SOA is not only a software-development model, but also an architectural, higher-level design model with the focus on the overall conceptual architecture and management of individual service components, as outlined by Holmberg and Steen (2012). This paradigm was introduced to help the organizations design the technological solutions in a coherent and repeatable way and to support the communication between other services. SOA is intended to save time on market deployment, and to assemble internal applications from existing services instead of developing everything from scratch. In principle, the implementation of SOA implies that

new applications can be constructed through the reuse of common parts to save time and money (Channabasavaiah, Holley, & Tuggle, 2003; Xu, 2011).

1.2 Research problem

The government plans to build services to optimize government processes, thus saving money and possibly making some processes simpler (Finansdepartementet, 2005). Several researchers recommend an architectural framework such as the Service-Oriented Architecture. Without such a framework, costs can hardly be reduced (Arsanjani, 2004; Erl, 2005; Åkesson, Skålén, & Edvardsson, 2008). The findings of Koumaditis, Themistocleous, and Cunha (2013) illustrate this point using the example of the health care sector. They show how errors in information systems may cost lives. On the other hand, critics such as Heffner (2009) demonstrate that only 41% of respondents report that SOA implementations were delivered as expected. A search of the current literature resulted in fragmented research findings regarding challenges in both the public and private sectors. Therefore, the authors of this thesis claim that it is important to look at the public sector specifically in order to improve understanding of the challenges the public sector faces when implementing SOA; if such challenges are highlighted, then there might be a possibility of finding solutions for them.

1.3 Purpose and Research question

Based on the research problem of this thesis, the purpose of this study is to highlight the challenges faced by the Swedish public sector when using Service-Oriented Architecture.

Thus, from the research purpose, the following research question is derived:

Q: What challenges does the public sector face with the implementation of Service-Oriented Architecture?

Furthermore, this thesis aims to contribute to further research which may help to facilitate the implementation of SOA in the public sector.

1.4 Delimitation

This study was also limited to a study of this subject from the perspective of only one organizational role; that of the IT Architect.

1.5 Structure

The thesis is organized into six sections with a pre-analysis step and a final presentation of the thesis (see Figure 1.1). The diagramming design approach is the model recommended by Maxwell (1996). The author suggests building a concept map consisting of the different parts interconnected with each other in order to understand the overall picture of the study.
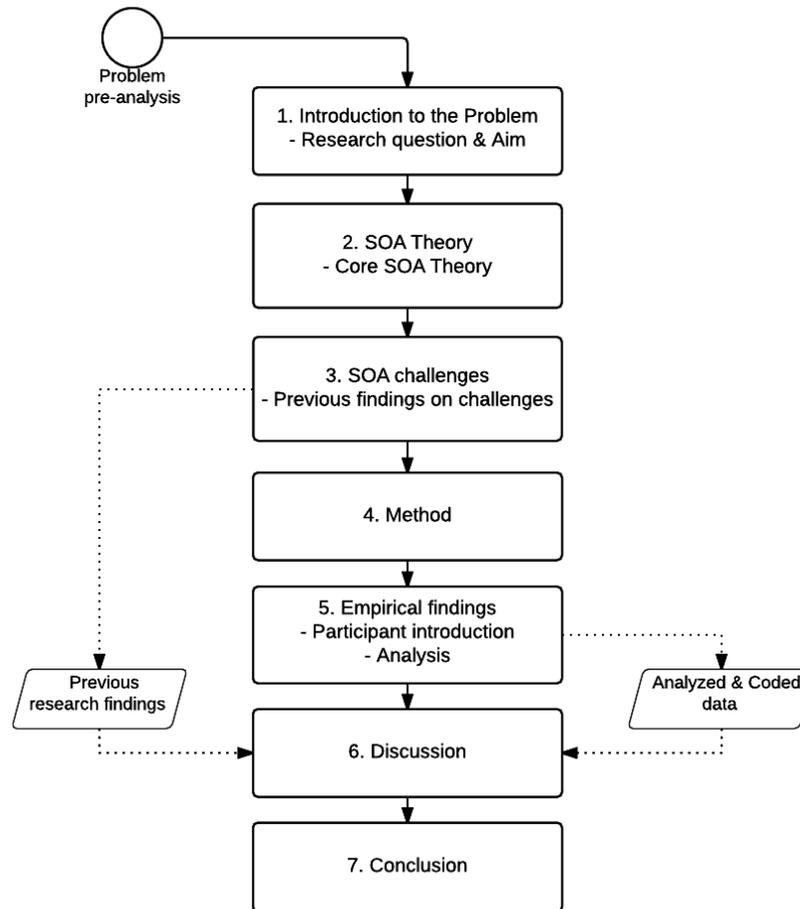
Figure 1.1: The thesis structure

In the pre-analysis step (the Thesis Proposal), the problem is discussed with the help of the literature overview in order to identify the research topic. **Chapter 1** defines the identified research topic and problematizes the research question. Then, in **Chapter 2** the research topic regarding Service-Oriented Architecture is further explained with the help of the literature review. **Chapter 3** established a theory framework from the previous research. The method of research design is presented in **Chapter 4**. Here, the methodological literature is discussed to ensure valid and reliable empirical results. The analysis of the interview and the empirical findings are presented in **Chapter 5**. The previous research and the analyzed empirical findings are presented and reflected upon in the discussion section in **Chapter 6**. In the conclusion in **Chapter 7** a summary of the entire thesis is presented.

2 SOA Theory

This chapter presents the core objectives behind the Service-Oriented Architecture, starting with a brief introduction to the historic perspective on object and component orientation.

To understand the SOA concept when presenting the empirical data, this thesis begins by presenting the background of Service-Oriented Architecture and its definition.

2.1 The Beginnings of Service-Oriented Architecture

Rosen, Lublinsky, Smith, and Balcer (2012) offer a good example of the beginnings of component and service-like software development. According to their example, the banks in the 1990s began to think about electronic information as a form of object, and business processes as software solutions. These banks used telephone support to access user information. To get the required information, the customer service personnel had to browse through different mainframe systems. This work was tedious and prone to error, because the terminals talked directly to the data storage computers, and only provided a complicated set of commands to extract the data. To tackle this customer support issue, the banks created a common software interface for each account, using a relatively new technology called Common Object Request Broker Architecture (CORBA). These newly created "CORBA objects" were then connected to separate user interfaces. This gave the support personnel a single interface for all operations. All of the important information about the banks' customers could now be gathered from a single screen. More importantly, this new architecture provided a way to reuse the common blocks of information (CORBA objects) in other user interfaces to create different solutions. This new architecture provided a new abstraction layer whereby the user interface was separated from the actual data. This was the beginning of 3-layer application architecture where business logic, presentation logic, and account information (i.e. data) were in three separate, independent layers. This created an infrastructure with different objects of data, which could be reused in other user interfaces. Figure 2.1 illustrates this solution, wherein the logic of the account is abstracted into an object (Rosen et al., 2012).
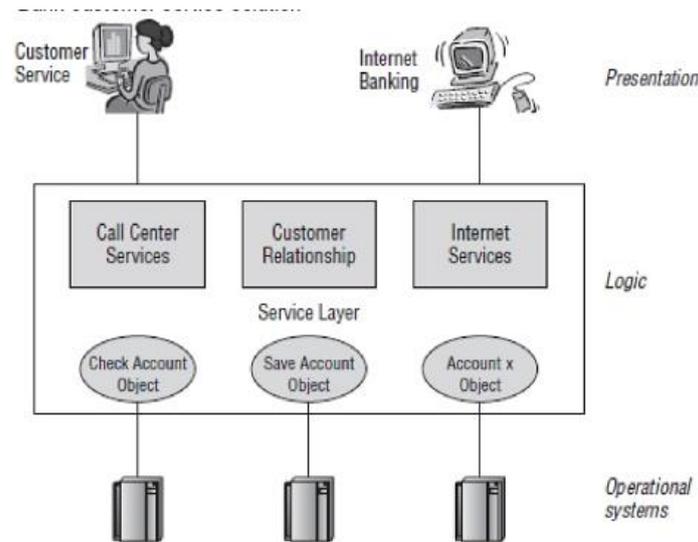
Figure 2.1: Service-Oriented bank solution (Rosen et al., 2012)

The example of the banks describes the origin of SOA, whereby each service in the service layer represents a specific business problem, such as "checking account savings" (Figure 2.1). With the rapid development of these services, organizations recognized the need for a new concept to create, manage, and control these services. These services had to communicate with each other, but this was problematic without a standardized protocol. The requirements changed to favor a platform-independent and rapid service creation, with an emphasis on the business problems, rather than the technology. Thus, Service-Oriented Architecture came into being because of its potential for solving these problems and defining a pattern for e-service development (Bennett et al., 2000).

2.2 SOA Definition

SOA stands for "Service-Oriented Architecture". To clarify the definition of "Service", "Service-Orientation" and "Architecture", these three terms will be explained in the following three sections.

2.2.1 Service

Service is a self-contained piece of business functionality, with a clear purpose (Stojanovic et al., 2004). A service is modeled from one specific business process; for example, accessing bank account information. A service should be independent and self-contained; by encapsulating the functionality, the service provides a common interface standard protocol for use. The service behavior is clearly defined to the service consumer (caller). The implementation technique of the service is then hidden from the consumer, in a so-called "black-box", so that only the purpose and the result of the service call is visible (Stojanovic et al., 2004).

2.2.2 Service-Orientation

Service-Orientation in the field of software development means a collection of logic integrated in a software component. This component is provided as a service to the component consumers,

where the consumer of the service can also be another service. These independent components, when connected, can provide the full support for a specific business process, such as "managing customer account" (Erl, 2005; Rosen et al., 2012).

2.2.3 Architecture

Zachman (2002) exemplifies how architecture historically relates to the world of software development. Architecture is when a human writes down a plan to build something complex, because he or she cannot remember every step of the building process at the same time. Then, when it is time to change the plan to accommodate shifting needs or demands, the person needs to edit whatever he or she wrote down. Because the software development world is becoming so complex, the need for architecture exists (Zachman, 2002). In relation to Service-Orientation, architecture is used to create a standardized plan to manage a complex environment with many services.

2.2.4 Summary of SOA Definition

According to Erl (2005), it is common for developers to perceive Service-Oriented Architecture as a technological way of building services. However, Erl (2005, p. 263) establishes the definition of SOA as an architectural pattern that "*can be realized through any suitable technology platform*". The basis of Service-Orientation is not in the technology, but in the separation of concerns, which means that large problems are separated into smaller, distinct, related parts, in the form of services. The SOA paradigm then helps to plan, develop, and manage these services in the IT environment. Therefore, in order to avoid confusion between SOA and technological implementation, this thesis adopts the following SOA definition, as defined by Erl (2005, p. 54): "*SOA represents an open, agile, extensible, federated, composable architecture comprised of autonomous, QoS-capable, vendor diverse, interoperable, discoverable, and potentially reusable services*".

2.3 Aspects of SOA

2.3.1 SOA Challenges

Regarding SOA challenges, the academic literature describes the technological management of governance problems behind SOA implementations. This can be the migrating of legacy applications to SOA or simply using SOA in the IT environment. Khadka (2013) describes the legacy application migration as a challenge, because of the high pressure to succeed. The SOA migration is typically full of technical and planning obstacles, often bringing long delays in organizational business processes. The author describes these legacy application migration challenges as the "torture of an enterprise" (Khadka, 2013).

2.3.2 SOA Critical Success Factors

SOA critical success factors (CSFs) are described by Galinium and Shahbaz (2012), and can be seen as the discussion in academic literature about the successful implementation of SOA. The implementation success can come from the technical perspective, the business point of view

and the governance of SOA implementations. Moreover, researchers often discuss the migration methods of legacy software to SOA as a critical success factor (Galinium & Shahbaz, 2012).

2.3.3 SOA Adoption

According to Erl (2005), SOA adoption means the success of using the new technology paradigm to create new benefits for the business. The adoption usually brings challenges, depending on how groundbreaking the adopted technology is (Erl, 2005). In many cases the adoption of technology to improve the organization's IT is one of the main drivers, and is also one of the processes that takes an *"enormous amount of effort"* (Erl, 2005, p. 19). The organization must be prepared to *"change all of their IT and business activities"* (Lee, Shim, & Kim, 2010, p. 1).

2.3.4 SOA Governance

Erl et al. (2011, p. 130) formulate the definition of SOA governance in the following way: *"A SOA governance system is the meta-decision system that an organization puts in place to control and constrain decision-making responsibilities related to the adoption and application of service-orientation."*

2.3.5 Service Orchestration

Erl (2005, p. 205) describes orchestration as a concept pre-dating SOA. Orchestrations often consist of business logic that is not limited to one of the participating systems or services and orchestration is considered *"...a key ingredient to achieving a state of federation within an organization that contains various applications based on disparate computing platforms."*

2.4 SOA Principles

This section introduces some of the main principles of SOA, such as the separation of concerns, loose coupling, and standardized service contracts.

2.4.1 Separation of Concerns

This means that a specific business task, such as "checking bank account", can be distinguished from the other logic, in order to handle this well-defined task. Stojanovic et al. (2004) state in their paper that the encapsulation of the business task has to be determined by the specific scope, and the amount of other components necessary to represent the business requirement as a software service. As illustrated in Figure 2.2, each service can represent a detailed **process step**, a **sub-process,** or the entire business **process** (Erl, 2005).
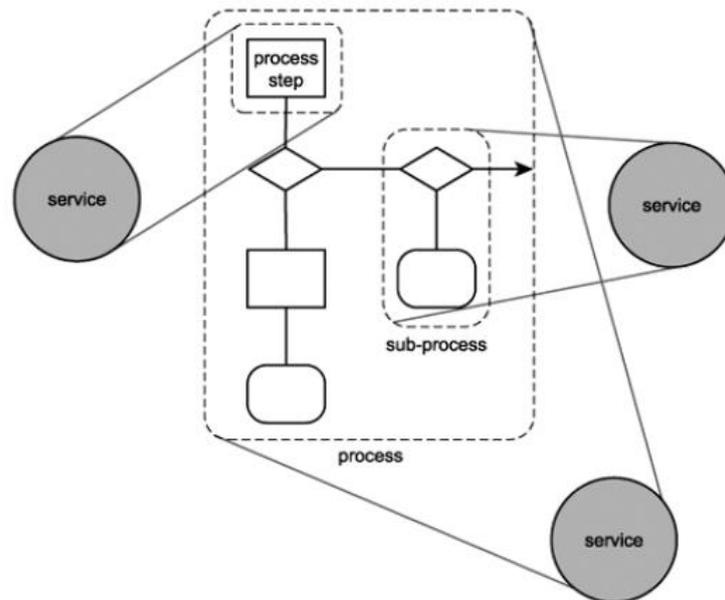
Figure 2.2: Service can encapsulate a varying amount of logic (Erl, 2005)

2.4.2　Loose Coupling

Erl (2005) defines a service as being loosely coupled when there is a low number of require-ments on the surrounding environment; for example, no or very few dependencies on other services. A loose-coupled service can work independently and has everything it needs to func-tion. The aim of such a principle is to create a flexible environment in which each service can evolve with minimal dependence on other services.

2.4.3　Standardized Contract and Vendor Neutrality

The service should be composed with a unified standard technology. There should be no de-pendency on a specific platform or language. This means that any user of the web service should be able to call the web service without needing to use vendor-specific programming language (C# or Java). When reducing this requirement threshold, the services can easily be used by other software systems, or even by other services to create new independent services. The advantage of standardization is the consistency of web service description, which makes it easier for users (or developers) to understand the capabilities of a given web service (Erl, 2005; Erl et al., 2011).

2.5　SOA Realization

As described by Erl (2005), a web service is one of the realizations of a service concept which encapsulates specific logic and technically implements the business requirement. Erl states that the web service is a framework which itself consists of different supporting technologies. This framework is both flexible and adaptable, and the logic can be programmed to support new business functionality or to simulate the existing functionality of other software. The latter tech-nique can be used to make non-SOA software SOA-compliant. Erl et al. (2011) explain that a

web service exposes the solution logic using a contract, usually with Extensible Markup Language (XML). The XML definition of the web services provides information about what output is expected from the web service.

2.6 Summary of SOA Theory

SOA started in the component-design area of the software development world. The growth of software components led to a better understanding of how a specific set of data could be organized into an electronic service. To create coherence and architectural patterns for the e-service development, SOA was imagined as a paradigm to standardize such development. The reviewed key SOA principles are the separation of concern, loose coupling and standardized service contracts (Erl, 2005).

3 SOA challenges – Theoretical Framework

This chapter presents the current research regarding the challenges in SOA implementation. The chapter begins by explaining how the source literature was identified. Next, the key challenges are gathered and categorized to serve as a base for later empirical analysis.

Seidman (1991) wrote that the stories of other people should not be ignored, and that to think that one already knows enough is to be "*anti-intellectual*". Therefore, the researcher must **deepen** the knowledge of the research problem and identify what other researchers have already done. One way to do this is to construct a theoretical framework. Maxwell (1996) states that such a theoretical framework can be used as a spotlight, to guide the researcher in the right direction. He also presents some of its disadvantages, such as that the researcher may miss important insights in the data because they are too different from the theory; therefore, the researcher must keep an open mind, even if the framework is used (Maxwell (1996).

As the "spotlight" for this research, the theoretical framework was constructed from the challenges identified by reviewing the literature from 2009 to 2015. As a guideline, the following papers are used: Beydoun, Xu, and Sugumaran (2013); Koumaditis et al. (2013); Lee et al. (2010). These authors have conducted similar studies and have identified the successes, challenges and adoption problems of a wide range of SOA implementations.

The motivation for using 2009 as the starting year for the theory review is the following. SOA reached widespread adoption levels around 2008 (Trkman, Kovačič, & Popovič, 2011) and by 2009 the SOA "hype" had reached its peak point and was stabilizing (Bradley, 2008; Trkman et al., 2011). The paper by Trkman et al. (2011) states that in 2008 many SOA implementation projects were initiated. Therefore, to examine the research after the widespread adoption of SOA, the authors selected the year 2009 as the starting point for the research on "SOA" challenges.

3.1 SOA Challenges - Source identification

To create a theoretical framework for empirical analysis based on the SOA challenges, the articles were identified using the search engines Scopus, IEEE Explore and Science Direct. The following is an exact list of the search engines:

- Scopus,   http://www.scopus.com
- Science Direct,   http://www.sciencedirect.com
- IEEE Explore,   http://ieeexplore.ieee.org

The process of identification began by searching for the keyword "SOA" on Scopus. The time filter was applied to get only more recent publications, starting from 2009. The identification began by applying the keyword and filtering. The search results identified 7043 papers. The papers were further filtered by adding the string "challenges" to the article title. This search strategy resulted in 59 papers. Many of these 59 papers did not have SOA as their main research point; thus, another filter was applied by adding an "SOA" string to the title, finally resulting in 7 papers.

```
KEY(SOA) AND TITLE(SOA) AND TITLE(challenges)
            AND PUBYEAR > 2009
```

A similar search strategy was then used on IEEE Explore, filtering after the keyword "SOA" combined with the filter on title strings "SOA and "Challenges". A further filter was also applied to obtain only publications from the year 2009 onwards, resulting in a list of six papers.

```
("Index Terms":SOA AND "Document Title":SOA)
     AND "Document Title":challenges)
```

The same search strategy was replicated in Science Direct. However, this search resulted in only one paper on Atmospheric Environment.

```
KEYWORDS(SOA) AND TITLE(SOA) AND TITLE(challenges)
                  AND 2009
```

Table 3.1 presents the chosen papers across all three online sources. The result from Science Direct was discarded because it deals with a different research topic (atmospheric environment) and the keyword SOA refers to Organic Aerosol Models in that context. The second discarded document was a paper by Tilley et al. (2010), which presented only an overview of a workshop and not an actual paper. Finally, the 8 papers were first reviewed by checking the journal, author and the publisher and accepted as literature framework. The final document types of the resulting papers are 5 conference papers and 3 articles.

Table 3.1: Selected papers, SOA challenges

Author	Scopus	IEEE Explore	Science Direct
Moreland et al. (2014)	x		
Napier (2014) (discarded)	∗		∗
Khadka et al. (2013)	x	x	
Safy et al. (2013)	x	x	
Beydoun et al. (2013)	x		
Hsiung et al. (2012)	x	x	
Tilley et al. (2010) (discarded)	∗		
White et al. (2012)		x	
Simanta et al. (2009)		x	
Murer (2011)		x	

3.1.1 The Literature Review

Below, the challenges are identified in each papers and coded with a number (N). The number is referencing the final compiled table (Table 3.2).

Moreland Jr (2014) tested the throughput capacity, latency and speed of common SOA technologies (SOAP) to determine whether they could handle heavy real-time communication in

combat for the naval warfare system. One of the first problems Moreland highlights is the delayed response when starting the tests. While Moreland points out that this might be the effect of the just-in-time mechanism in the Java Virtual Machine, (1) real-time communication remains a critical challenge. Moreover, another key challenge highlighted in the paper is (2) the migration of complicated, critical legacy systems.

Khadka (2013) presents the challenges behind legacy application migration with SOA in the Dutch financial institutions. The key aspect of these challenges is the need for a practical technique to reverse-engineer large applications. This procedure is difficult to estimate, because the application subparts are entangled with a huge amount of internal functionality, pointing to different parts of the application. The author emphasizes the need for future research on the automatic feature identification and language translation of such applications. The challenges extracted from this article are: (9) Estimation of migration cost; (2) planning and technical challenges of legacy migration, specifically with reverse engineering the legacy applications to SOA.

Safy, El-Ramly, and Salah (2013) identify the key challenges in (11) the monitoring of running SOA applications. The authors point out that the solutions to the monitoring challenges are important to guarantee the quality of the services. Another highlighted challenge is that the diversity of the formats and protocols brings (3) compatibility problems, which complicates the monitoring of the running applications.

Beydoun et al. (2013) present a SOA usage example for constructing airline control software. The SOA implementation encounters reuse difficulties and a (7) challenge in requirement understanding. Moreover, the lack of requirement understanding by the original developers creates problems for the parties that do the software-composition from these services. Many times the software components do not function well together because of the (3) compatibility issues.

Hsiung, Rivelli, and Huttenegger (2012) demonstrate how to use SOA in the global infrastructure at the Credit Suisse financial company. The article identifies (3) the compatibility challenges of SOA services with different platforms. In fact, standardization is recommended by SOA literature; however, the authors argue that it may not be economically appropriate. (11) Monitoring of the SOA services is highly important to apply jurisdiction and security rules. Another significant challenge mentioned by the authors is (10) managing the complexity of SOA services in a global infrastructure distributed around the world.

White et al. (2012) present the challenges of ensuring the (3) compatibility of services with other software. Since there is a huge variation in the implementation, attributes, descriptions, and datatypes of services, it remains problematic to effectively (10) manage the services. The author argues that when switching to SOA, there are challenges with different (6) services working together (interoperability and cooperation) and this may hide high implementation costs. The control system from the US governmental Department of Defense was used for the study to exemplify the challenges.

Simanta, Morris, Balasubramaniam, Davenport, and Smith (2009) describe the challenges of maintaining (4) SOA security in the public and widely available web of services. The precise SOA security challenges consist in the unreliability of the third-party services, which may be badly coded, or impossible to code-control due to the "black-boxed" nature of the services, and may rely on other unreliable services in the background. Therefore, (5) information assurance in public services remains a highly important challenge. When the service crashes or is compromised, it brings down the entire dependency network of other systems.

Murer (2011) describes a report on the Credit Suisse financial company. The author highlights the importance of strong (3) compatibility between services. One of the possible solutions for increasing the compatibility is the standardization of the semantic definition of each service. However, the actual (8) definition of the standard presents a new challenge, because the semantics have to support the high variation of business models.

3.1.2 Identified Challenges and Categorization

In his paper, Baker (2012) presents a general framework named Technology Organization Environment (TOE), which is used to facilitate the adoption of technology in three areas: technology, organization, and environment. IBM presents another framework for classification based on four dimensions: organization, technology, governance, and management of the plan for adoption (Varadan, Channabasavaiah, Simpson, Holley, & Allam, 2008). In the paper by Hirschheim, Welke, and Schwarz (2010) the authors state that it is important to look at the business motives behind the SOA. Thus, the authors identify six distinct dimensions for SOA evaluation: view of SOA, expectations, management, methodology, technology and governance. The studies by Beydoun et al. (2013); Koumaditis et al. (2013); Lee et al. (2010) have performed classification using the frameworks mentioned above to identify and arrange the SOA factors of success, failures and challenges. Derived from these papers, the following aspects are repeated most frequently, and therefore were chosen as the category areas for this research: (1) **Technical**; (2) **Management**; (3) **Strategy**; and (4) **Governance**. The challenges were then matched together with the category areas by looking at the papers by Beydoun et al. (2013); Koumaditis et al. (2013); Lee et al. (2010) to validate the matching. Some of the challenges fit in two categories; for example, service cooperation is both a technical and a management problem. The organizations need to create stable cooperation practices with other organizations (management) before performing the technical implementation. The following Table 3.2 shows the category areas in the left-hand column and identified challenges in the middle column; the columns on the right map the research papers to the challenges, marked with a letter 'x'.

Table 3.2: Identified challenges for SOA implementation in recent research

#	Category (s)	Challenges	Moreland	Khadka	Safy	Beydoun	Hsiung	White	Simanta	Murer (2011)
1	Technical	Real-time communication	x							
2	Technical	Legacy software migration	x	x						
3	Technical	Service compatibility			x	x	x	x		x
4	Technical	Security							x	
5	Technical	Reliability and Testing (Assurance of stable service)							x	
6	Technical, Management	Making services work together (cooperation)						x		
7	Management	Requirement understanding					x			
8	Management	Definition of standards								x
9	Strategy	Legacy migration cost estimation		x						
10	Governance	Governing SOA complexity (SOA Overhead)						x	x	
11	Governance	Monitoring services			x			x		

4 Research Method

This chapter presents the motivation behind the choice of the research method, which is the semi-structured interview with the IT Architects working with SOA implementations. The validity was verified by recording, transcribing and coding the interviews.

The purpose of this research is *to highlight the challenges affecting the implementation of Service-Oriented Architecture.* There are several methods for conducting such studies; one is the quantitative research method. The primary focus of the quantitative method is transforming information into numbers from which statistical analysis can be derived. According to Yin (2010), a disadvantage to choosing such a method is that the answers to actual experience (or, in this case, challenges) will be difficult to measure. Therefore, a qualitative approach is more appropriate for this study, which aims to "highlight the challenges". As Seidman (2005) argues, the qualitative study can be used to gather experience from close interaction with people who have had such experience.

Seidman (2005, p. 9) states that one way to undertake qualitative research is to conduct an interview. The primary motivation for interviewing, as described by Seidman (2005, p. 9), is "*an interest in understanding the lived experience of other people and the meaning they make of that experience*". Thus, the qualitative approach corresponds well with the research aim of this thesis.

Several naming conventions exist for the person who is interviewed, depending on the field. Terms such as *interviewee, respondent*, *subject*, *informant*, and *participant* are among the most popular. This thesis uses the term *participant*, as used by Seidman (2005, p. 14), because it reflects the active stance of the people being interviewed. This naming convention implies that the people who are being interviewed are a part of the research.

Maxwell (1996) presents several approaches on how to conduct the qualitative interview. *Structured* and *unstructured* methods are two examples. The structured approach demands that the questions are asked in the same order each time; this ensures that the data can be compared between the different participants and the researchers (Maxwell, 1996, p. 100). On the other hand, the unstructured approach offers the ability to understand the processes which have an impact on the problem in question. Nevertheless, Miles and Huberman (1994, p. 19) warn that unstructured research makes sense only for experienced researchers with a great deal of time available for the study, when exploring complex social phenomena or understudied fields. Since both structured and unstructured approaches have strong advantages, it is common to combine both the structured and unstructured approach, therefor this thesis will follow the advice of Maxwell (1996) and conduct the Semi-Structured interview. This method allows the opportunity for asking open-ended questions. Moreover, the research will be conducted as a four-step process, as recommended by Maxwell (1996). These steps are: (1) the establishment of a relationship with the participants; (2) the selection of the specific individuals for the study and the information to be used as a source; (3) the data collection method; and (4) the analysis of data collected.

4.1 Establishment of a Relationship with Participants

The establishment of a relationship occurs between the participants and the researcher in order to create validity in the answers and to help understand the participants better. The researcher has to create a code regarding how close a relationship is required; most important is that all participants are on the same relationship-level. Maxwell (1996) gives an example of a study for which he had to live with a family. With such a close, everyday relationship, the gathered data was very insightful. However, when he tried to replicate the same study on another family with whom he did not live, it was much more difficult to gather the data at the same level of depth. Through this example the author points out that changing the relationship with the participants both "*facilitated and constrained*" his research (Maxwell, 1996, p. 104).

In this thesis, the relationship was established by first briefly sharing the purpose of the interview and the roles of the participant and the interviewer. Each participant was given the option to be fully anonymous and had the ability to cancel the interview.

4.2 Selection of Participants

This study uses the *criterion-based selection* method for the sampling of participants. The decisions on the selection and sampling were made according to the guidelines given by Maxwell (1996) and Miles and Huberman (1994). These authors point out that one cannot study everything, and the study has to have a limit. It is important to create parameters on which the study will be based and use these parameters as restriction filters.

According to Maxwell (1996, p. 108), the appropriate research model for qualitative research is *criterion-based selection*. Due to the nature of qualitative research, only particular participants must be selected to provide the required information. Therefore, it is applicable to use *criterion-based selection* in this qualitative research (Maxwell, 1996).

Based on Maxwell (1996), the following criteria will be used in this research to select the participants: (1) the organization must have an existing SOA initiative; (2) the organization must be part of the Swedish public sector; (3) the participant must work as an IT Architect and be involved in the SOA implementation.

4.3 Data Analysis and Presentation

4.3.1 Analysis

When conducting the interview, Maxwell (1996) recommends using data analysis techniques such as labeling, sometimes called classifying or coding data. Seidman (2005, p. 142) warns researchers not to apply the coding too fast on the transcript in order to avoid bias. Quite likely, the first thing that comes to mind may be affected by the subjectivity of the researcher, thus increasing the risk of supporting the researcher's personal opinion. To tackle this issue, Bryman and Burgess (2002); Maxwell (1996) discuss a practical approach with several steps. The (1) first stage is to read the transcription and make notes; (2) (3) the second and third steps are to highlight and categorize chunks of text, preferably in another document such as a spreadsheet. While categorizing the interview, each passage should be labeled with a number, according to

Seidman (2005); this helps with retracing to the original text when the passage is referenced in the discussion text. Finally, Miles and Huberman (1994) suggest **using data matrixes** to link up the research questions with the research strategy, and to display the connection to the specific categories and datasets. Figure 4.1 illustrates the analysis procedure performed in this thesis: the interview was first analyzed in three steps by each coder (the authors of this thesis); the codes were then compared, and finally a data matrix with the codes was created.
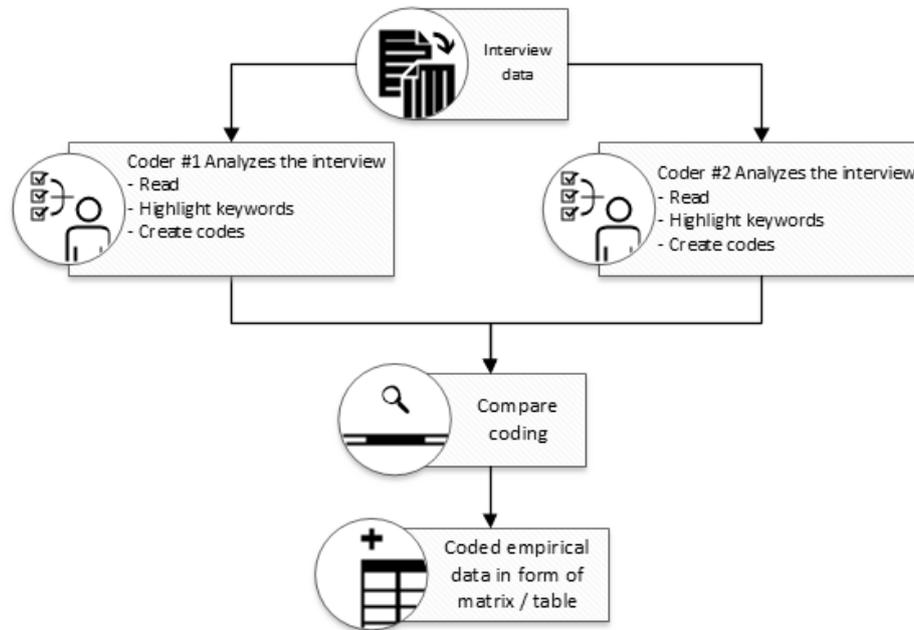
Figure 4.1: Coding the interview - workflow

Table 4.1 illustrates an example of the coding strategy of data analysis. The keywords are shown and code is applied to mark a specific category. The letter "**T**" is the code (the right column) which stands for Technical (**T**). The color coded text stands for specific passages in the answer connected to one or more categories.

The goal of such a system is to organize the answers into appropriate categories and keywords that that facilitate the analysis of the results (Maxwell, 1996; Miles & Huberman, 1994; Seidman, 1991). 1991). Furthermore, in

Table 4.2 the keywords and the codes are combined to create a code matrix. The coding categories used in this thesis are Background (B), Strategy (S), Technical (T), Governance (G), Management (M) and Business Acceptance of (A). All categories except for Business Acceptance (A) are derived from the theoretical framework in Chapter 3.1.1. The Business Acceptance category was constructed as a new category under the interview analysis.

Table 4.2 shows an example of coding matrix, which combines the participant reference (P1 or P2), the line number relating to the participant interview transcription, the identified keyword on the challenge, and the category. This thesis uses the papers listed in Chapter 3.1.1 as a guideline for labeling particular "challenge" keywords with the specific category.

Table 4.1: Example of interview coding with color coded green and purple passages

Question & Answer	Code

Researcher 1: Why did you adopt SOA?	
P1: We wanted to avoid the <mark>spaghetti</mark> <mark>of legacy systems.</mark>	**T**

Table 4.2: Example of the coding matrix with keywords and two category levels

Participant	Line #	Keywords	Category level 1
P1	8	too many small parts	Governance
P1	8	overhead cost for services	Management
P2	12	making too many services	Governance

4.3.2 Presentation

Seidman (2005) discusses several strategies for conducting the analysis. One is a profile presentation, which is done by shaping the profile of a participant to represent their point of view. Story-telling is a means of communicating and learning which coherently displays the events and experience of the participant. The second strategy presented by Seidman (2005) is categorization. This is done by identifying the keywords from the data and fitting them into a category. Examples of categories in Seidman's context could be "impact on family, background of provider, parents". The data can then be presented based on each category.

This thesis presents the data using two strategies to create two different pictures of the empirical data. First (1) a profile is presented with a summary of the story, the key elements being discussed from each participant's point of view. Next (2) the challenges are categorized and presented under the same categories used in Chapter 3.1.1.

4.4 Data Collection Method

The semi-structured interview was conducted to collect the data. To create a valid interview, the questions were categorized and constructed to cover a wide area around the main research questions, as recommended by Miles and Huberman (1994). These authors recommend that the *research questions* should not directly connect to the interview questions. In fact, although the research question is what the researcher wants to understand, the *interview questions* are what the researcher needs to ask the participants in order to gain that understanding. Maxwell (1996) describes the risk of asking the research question as an interview question, which is that the participants will tend to give an answer that is already commonly known to the researcher.

4.4.1 The Interview Guide

The purpose of the interview guide is to standardize the interview procedure. Maxwell (1996) emphasizes the importance of the preparation of the interview guide. It lends greater validity to the research, as it standardizes the interview questions. Miles and Huberman (1994) recommends to ask questions in a wide area around the research question. Therefore, the questions in the interview guide are derived, with the consent of the original authors, from a survey undertaken by Hirschheim et al. (2010) which covers a wide spectrum of SOA implementation aspects. In keeping with Maxwell's advice, the questions are organized into four categories connected to the abovementioned theoretical framework from Chapter 3.2.

To find the answer to the research question, the participant criterion was employment in the position of "IT Architect" in a public sector organization working with SOA implementation. The role of IT Architect encompasses aspects of the skillset of both the management, in terms of the business domain and organizational politics, and the more technical roles such as software developers (Eeles, 2006). Due to this, asking IT Architects a range of questions from both technical and business perspectives is appropriate in order to highlight the challenges presented by SOA.

The interview guide is presented below. Brief introductory questions were asked about the participants' own backgrounds as well as the definition of SOA from each participant's point of view. The rest of the interview questions are presented by the four categories: (1) Strategy; (2) Technical; (3) Governance; and (4) Management.

Background questions
The purpose of these questions is to identify the reasons why SOA is used in the Organization. Moreover, the aim is to understand how the organization define SOA and what expectations and benefits they have from SOA. The last four questions ask the background information from the participant.

- How do you define Service-Oriented Architecture?
- Why do you use SOA?
- What are the benefits of SOA?
- What worries you about SOA?
- For how long have you worked with SOA in your Organization?
- How many services have you released?
- How many SOA services are currently active and running?
- Is your Organization innovative?

Technical questions
These questions are constructed to give the insight on the technical aspect of SOA and reveal how the organization is optimizing their processes using SOA.

- Do you build your services on top of existing Organization processes?
- What relationship do you have between your organization processes and modelling SOA?
- Do you have some system to help the users find your services?
- How do you secure your SOA services?
- What technology or software do you use to integrate services built with SOA with your legacy software?
- Can you name any technical difficulties with successful SOA implementation?
- Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)?
- Do you see SOA as a method to reuse software?
- Does SOA affect the spending plans of your Organization? (More cost efficient)
- Should SOA be based on the organizational model?
- Is your Organization facing any challenges right now?
- Does SOA aid you to face these challenges and to what level?
- How will SOA affect your IT Organization?

Governance questions

Governance questions are asked to get the insight on how SOA services are governed and how the Organization could change to create SOA governance.

- Do you use any metrics to measure the success of SOA projects?
- Can you tell anything about the governance strategy in your Organization?
- Was there ever a need to change the IT governance because of SOA?

Management & Strategy questions

While IT-Architects mainly solve the technical solutions by building the structure, architecture and the services themselves, they may be closely related to the strategy and management of SOA (Eeles, 2006). Therefore, it is interesting to hear the IT-architect point of view on how the management and strategy works in their Organization.

- Who is the main initiator behind SOA implementations?
- How do you plan your SOA implementations?
- Who has the overall responsibility for SOA in your Organization? (If SOA comes from top-down or bottom-up)

4.5 Research Validity and Reliability

According to Maxwell (1996), validity is the relevance of the asked questions to the research. Reliability in this context means that if the researcher asked the same question twice, he or she should get the same results. The questions have to be constructed in a way that ensures the reliability. Objectivity is about the researchers not mixing their own beliefs and bias in the questions to the transcribed answers. Maxwell (1996) warns that qualitative studies often rely on small numbers of participants for all their data, especially when using *criterion-based selection*. This results in key informant bias, whereby small numbers of people are said to represent the group although there is little guarantee that the views are representative. Maxwell (1996) suggests performing a systematic sampling of participants, in order to avoid group bias, as well as establishing a proper relationship code with the participants. Therefore, in this thesis the sampling was performed by randomly selecting employees from different public sector organizations. To find the contact information for employees, LinkedIn.com was used as the search engine. The work-position search term "IT Architect" was used to produce a list of employees, who were then systematically contacted by e-mail and asked if they wanted to participate in a study. The first four positive answers were selected for the interviews.

According to Maxwell (1996), securing validity, at least to an acceptable level, can be achieved by focusing on the *description*, the *interpretation*, and the *theory* of the qualitative research. The *description* has to be valid, so that the researcher can accurately present the data. One way to make sure it is valid is to record the interview. The valid *interpretation* refers to the danger of imposing one's own framework on the interview answers, by not listening and only making assumptions or by asking short and closed questions, which restrict the opportunity to reveal participants' own perspectives. The *theory* validity refers to the risk of ignoring the participant data or not considering alternative explanations. Maxwell (1996) explains that the establishment of vague and abstract propositions should be avoided; instead, the concrete evidence from the interviews should be presented. Reactivity is another possible factor to consider in a qualitative study, which means that the researcher and the environment influence the participants and their answers. Therefore, it is important to understand how the researcher may influence

the study in each particular interview and how this may affect the validity (Maxwell, 1996). The common ways of checking the validity are by asking questions with negation, triangulation of data collection, and through feedback from an external source (Maxwell, 1996; Miles and Huberman, 1994). The following validity checks will be used for this thesis, as they were recommended by Maxwell (1996): *comparison* to other similar studies and the results, *feedback* from an external source, and asking *questions with negation*.

4.6 Ethics

Seidman (2005) mentions that during interviews ethical issues may arise. The classic example is that the interview participants may feel uncomfortable, as the interviewer not only exploits the information they share, but also takes their time. The author further argues that often, the cost of information and the ways in which it may further advance the researcher's power should be considered. The ethical issues were tackled in this thesis by minimizing the possible damage to the participants in case their views were not approved by the organizations for which they work (by anonymizing them). The participants were given the opportunity to review the transcribed interview to secure their final acceptance.

4.7 Summary of the Method

Maxwell (1996); Miles and Huberman (1994); Seidman (2005) all provide information on how the research study can be planed and conducted. After reviewing their recommendations, the following research plan was derived for this research:

The interviews were conducted according to the following steps: (1) The participants were selected from IT Architects in public sector organizations working with SOA implementation. (2) Semi-formal invitations with the overall topic theme were sent out by e-mail prior to the interview. (3) To establish the relationship, the interviews began with a short presentation of the research thesis and the authors. The participants were presented with the option of being fully anonymous and were told they had the right to cancel the interview. (4) The interview itself was conducted in a semi-structured format. (5) After the interview, a transcript was sent to all participants for their final acceptance. (6) The analysis was conducted using a coding technique and a data matrix. (7) Finally, the analysis was validated by comparing similar studies, asking negation questions and receiving feedback.

5 Empirical Findings and Analysis

This chapter presents the background information about the participants and their work. Next, the results of the empirical findings are presented.

5.1 Presentation of Participants and Organizations

A summary of participants and their backgrounds is shown in Table 5.1.

Table 5.1: Participants – short description

Participant	Description	Organization
P1	**Work Experience**: 15 years **Current Role**: IT Architect	Large governmental organization
P2	**Work Experience**: 20 years **Current Role**: Integration (IT) Architect	Skatteverket
P3	**Work Experience**: 33 years **Current Role**: Senior Integration (IT) Architect	Swedish county (Landsting)
P4	**Work Experience**: More than 10 years **Current Role**: IT Architect	Swedish county (Landsting)

The interview method: Phone interview, with additional contact via e-mail.

Participant 1: works as an IT Architect at one of Sweden's larger governmental agencies which employs between 5,000 and 10,000 people. Most of the IT related initiatives are focused on improving cooperation between this organization and other public sector organizations, but some services are published for the public to use. P1 asked to remain anonymous.

Participant 2: works for Sweden's governmental tax agency (Skatteverket), which has over 10,000 employees and offices throughout Sweden. Other than carrying out tax collection in Sweden, important functions of Skatteverket are the registration of residents and registration of estate inventories. The registration of residents deals with information on who lives where in Sweden. Every citizen and temporary resident is issued a personal identification number, which is used in Sweden for the unique identification of that citizen when in contact with local, county or governmental agencies, banks, insurance agencies and other private organizations. Skatteverket also deals with the issuance of personal identification cards, marriage registration, and registering other personal information about Sweden's citizens. The estate inventories are used to register inventories of the estates and liabilities of deceased people (Skatteverket, 2015). The P2 did not ask to remain anonymous.

Participant 3: has worked for more than 33 years in the IT sector and has had 14 years of first-hand experience with SOA implementations. The participant retired in 2014; nevertheless, he spent the last 4 years of his career working in a large Swedish county as a Senior Integration

Architect. The county has over 1 million inhabitants, and employs over 30,000 people. P3 asked to remain anonymous.

Participant 4: has worked in the IT industry for 10 years and is currently an IT Architect employed by another of Sweden's larger counties. The county has over 30,000 employees and has over 1 million inhabitants. P4 asked to remain anonymous.

5.2 Results

The results are described in three parts. First, the analyzed data is shown as the participants' **profiles**; the data is secondly presented under each challenge category, and finally as a **matrix** of identified challenges. All the parts are interconnected and refer back to the interview line number; for example, "(24)" represents line 24 of the transcript of the specific interviewed person (P1, P2, P3 or P4). Figure 5.1 illustrates the three different parts and their interconnection.
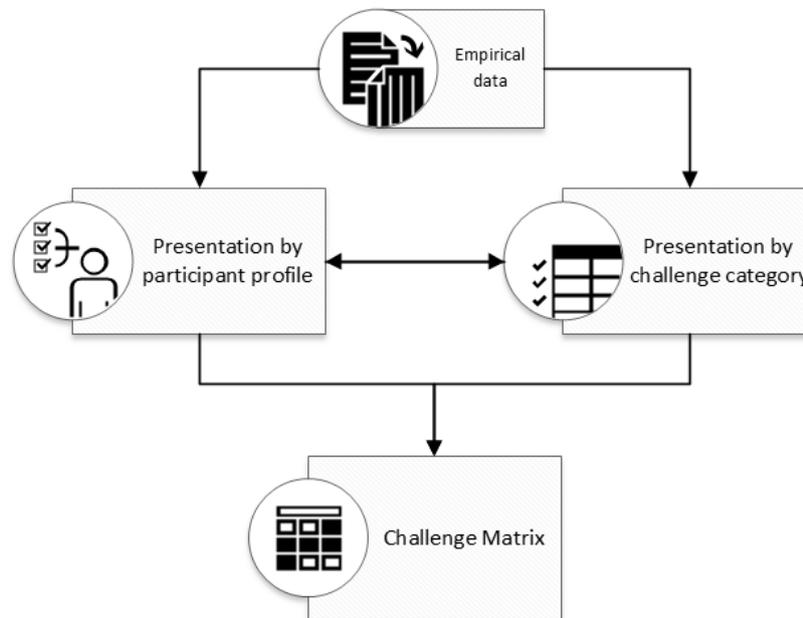
Figure 5.1: Illustration - Presentation of the results

5.2.1 Empirical Data - Participant Story/Profile

In this part, the empirical data is presented by shaping the presentation into a story, connected to the participants' profiles, as discussed by Seidman (2005). The story of each participant was extracted by analyzing all of the answered questions. The story starts with the current SOA status and experienced SOA challenges.

5.2.1.1 Participant 1 – Large Governmental Organization
P1 explained that the purpose of using SOA in P1's organization is to reuse and break down complex systems, and to create a loose coupling of existing graphical user interfaces (4, 6, 32). According to P1, this should help to quickly replace parts of software in the future. In addition, in P1's organization SOA is used to facilitate cooperation with other state organizations and to modernize current legacy systems (4, 18, 38, 44).

Some of the key challenges, as P1 explained, are the granularity level of each service. In particular, it is hard to know where to stop when creating a service. There is a risk of ending up with a *spaghetti* of services (8), creating an even worse environment than before the modernization (8). It can be costly if many services are built but are not reused, since SOA has an overhead cost (8). Usually the services are created ad hoc (46) as they are required and they are not planned top down (46). Moreover, it is challenging to find a natural ownership for the created services (42). The vision and goals are not communicated, the management does not understand what to do with SOA and technical personnel build services without real support from the management (28, 46).

Keywords in interview: loose-coupled user interface, cooperation between state agencies, break down giant system, modernization of legacy system.

5.2.1.2 Participant 2 – Skatteverket
P2's organization has had SOA as a part of its IT strategy for several years, but had only recently taken some steps to implement it (46). As P2 explained, Skatteverket is using only some parts of SOA and it is referred to as the "Skatteverket version" (20). The old legacy systems are not migrated, and most of the SOA services are planned and implemented for new initiatives. Some of the legacy systems have exposed services that were built-in inside the legacy application; nevertheless, according to P2 they are not recognized as being a part of SOA (52).

For the challenges, P2 named the governance and ownership of SOA and services (48), as it is unclear whether the consumer or the service provider should pay for the work required (8). An understanding of how to test services remains a challenge (48), as does an understanding of the overall positive effect of the services which, as P2 points out, varies from person to person (48). Another challenge is external. In particular, it is a challenge to make citizens use the e-services created by Skatteverket (38). As an overall challenge, P2 named the lag in technology, as a lot of things are still made in the old way (16). P2 says the organization is not allowed to be cutting-edge (16) or to take any risks with new technologies (16).

Keywords in interview: SOA owner, the cost for SOA, testing services, awareness of services to public, slow IT adoption.

5.2.1.3 Participant 3 – Swedish County
The first impression from P3 was that he felt the organization was slow to adopt IT (8, 18, 40). A large number of its employees were originally from health care, with which the organization has much involvement (8). This creates islands of IT understanding, where the organization has two sides; the IT and the employees. Regarding the IT side, the Architects want to optimize different departments, so that the organization would have money to hire more medical personnel (34, 50). The IT Architects have a goal of opening health care data to the citizens, providing access to such things as medical journals, and integrating these with the citizens' technological devices, such as iPads and armbands (38). Yet, on the other side, there are departments which still do manual file-handling (34), and staff who are afraid of losing their position of elevated status (8), who are afraid of change in general, and who have a lack of understanding of IT and SOA (8, 34, 38, 50).

P3 sees challenges in the security of public services, where sensitive data needs to be exposed (38). Moreover, in the overall organization culture, because of the low IT understanding, the employees have a hard time understanding SOA, which means that the IT department gets less money for SOA (8, 50). Another factor is the fear that SOA optimization will force them out of

their positions (8). The technical challenge is the service reliability to make important health care data available in a short space of time (42).

Keywords in interview: Security, service reliability, organizational change, slow IT adoption, SOA complexity and understanding.

5.2.1.4 *Participant 4 – Swedish County*

P4 revealed that the organization mainly uses SOA for enabling existing data integration and exposure for other services and customers. The organization does not really have an IT strategy that explicitly supports the implementation of SOA. Therefore, the IT department decides whether SOA is required to create a required solution (8, 46, 49).

P4 explained that the main challenges are in the non-technical area, and are mostly governance-related (28). Moreover, another problem is gaining access to services from vendors of other software or products. P4 noted that the vendors do not want to create interfaces so that P4's organization can create reusable services itself (28). The technical challenge P4 named is in the area of real-time communication and the increased latency introduced by a service layer. P4 spoke about cost savings when merging systems together using SOA; while it brings possible savings in the longer term, it also creates a complexity overhead, which costs more in the short term (28, 34, 38). P4 named governance as a big challenge; there is more experience of controlling monolithic client-server systems, so when implementing SOA, the organization itself needs to change because SOA requires the governance of separate services (42).

Keywords in interview: No integration strategy, ad hoc, SOA complexity and governance problem, organizational change, real-time communication, cost estimation.

5.2.2 *Empirical Data – Presented by Challenge Category*

This part of the empirical data presentation is done according to the challenge category area, as exemplified by Seidman (2005). The matrix of the identified challenges is constructed to display the aggregated connections of each challenge, participant and category, as suggested by Miles and Huberman (1994). The interview matrix is presented in Table 5.2. The numbers in each participant column (P1, P2, P3, and P4) represent the line number from the interview transcript. When the participant column references a line number, it means that the participant mentioned that challenge in the interview. An empty cell in the participant column means that the participant did not mention that particular challenge in the interview.

Table 5.2: The Challenges Matrix, ordered by category, challenge and the four participants (P1, P2, P3, P4)

Category	Challenge	P1 line#	P2 line#	P3 line#	P4 line#
Technical	Real-time communication			42	28
Technical, Management	Making services work together (cooperation)	4, 38	20,42		
Technical	Testing services		48		
Technical	Reliability, Assurance of stable service			42	
Technical	Security		24	38	
Technical, Strategy	Legacy software migration	14			
Governance, Strategy	Legacy migration cost estimation		8, 34		34

Governance	Governing SOA complexity (including SOA Overhead and Monitoring)	8,28	2,8	48	8,28,34,42
Technical, Strategy	Vendor software customization	28	28		
Strategy	Lack of strategy	28,46			46
Business Acceptance, Management	Organizational change (including SOA value)			8,20,40,50	42
Business Acceptance	Slow IT adoption		8,16	8,40,52	
Business Acceptance	SOA owner	42		54	

Next, the challenges categorized in Table 5.1 are explained in closer detail below.

5.2.2.1 Management

P2's organization is facing a challenge in that the unit (ICC unit) that bears the responsibility for the overall SOA initiative is not currently working together with the unit that is doing the business planning and modelling (BPM) (20). P2 also thinks that the SOA initiative will lead to a greater need for cooperative work in general (42).

5.2.2.2 Technical

P1 talked about the challenges involved in a technical implementation of the cooperation that exists between different organizations in their governmental sphere (4, 38). P1 also mentioned that a major factor driving the SOA initiative at their organization is the modernization of a legacy system (4).

P2 saw a potential major technical obstacle in the risk of choosing an integration platform that requires a lot of adaptation before it can become a useful tool (28). Another challenge P2 could see is changing the approach to testing, as the organization moves from end-to-end testing to service interface testing (48). A security challenge, according to P2, is in ensuring the flexibility of implementing it while still staying within the guidelines (24).

P3 pointed out that the security challenges involved in communicating sensitive personal information to citizens constitute the single most important technical challenge in the organization's SOA initiative (38). P3 had concerns about the reliability of the service when publishing important medical data that needs to be available quickly in different facilities (42).

P4 could see one technical area that can be troublesome, which is where there is a need for extremely low latencies and response times to serve real-time applications (28).

5.2.2.3 Governance

P1 considered the risk of building many SOA services that have little or no re-use. One of P1's major concerns about the SOA initiative was the overhead cost when developing services with SOA (8).

P2 expressed several concerns about the lack of governance. One of the issues is in the process of approving services for inclusion into the SOA (8). Achieving service orchestration capability and service lifecycle management are two other concerns which P2 saw in this context (2). P2

also pointed out the issue regarding who should pay for the increased initial cost of a service in SOA; the service provider or the consumer (8).

P3 stated that the challenge of keeping service providers up-to-date about their consumers is an issue that is not working very well in most areas of the organization (48).

P4 saw a more demanding situation for resource owners due to the new architecture. Instead of managing one system, the individuals responsible are now tasked with managing and maintaining a number of services, each of which could be seen as an independent entity. P4 pointed out that this challenge only accelerates in a larger organization such as P4's Organization (8, 28, 34, 42)

5.2.2.4 Strategy
P1 found the lack of support on a strategic level problematic, and thought that some staff on that level of the organization considers the acquisition of an integration platform to be all that is required in terms of an integration strategy (28). The lack of communicated vision and goals results in short-term, reactive work in the area (46).

Both P2 (34) and P4 (8, 34) foresaw IT investment increasing in the early stages of the implementation through a higher overhead cost as the architecture is being established, with the benefits of increased cost-effectiveness only being realized further on. P4 could only find indirect support for the SOA initiative in the organization's strategy and IT strategy (46).

5.2.2.5 Business acceptance
Transferal of the ownership of the services to the business side in a way which ensures a mutual understanding of the responsibility has been a problem that was recognized by both P1 (42) and P3 (54).

In the context of innovative organizations, P2 talked about how the considerable IT legacy, as well as the rules and guidelines of the organization, acts as a delaying factor for new initiatives (16). P2 also discussed the need to "missionize" the advantages of SOA, and added that the parts of the organization still do things in what P2 considered an old-fashioned way (8, 16). The respondent assumed that this could lead to a "raw data" type of service that P2 did not consider as being real SOA (8).

P3 considered these challenges to arise partly due to the inability to see the big picture and the lack of IT competency in general on both the business side and the management side (8, 20, 40, 50). This could lead to lower investment in implementing SOA in the organization (8). P3 also mentioned the difficulties of gaining acceptance for the value of SOA (8, 50).

6 Discussion

In this chapter, the empirical findings are discussed. The theoretical framework is referenced to verify this study by comparison to similar challenges found in other studies.

To fulfill the aim of this thesis – which is *to highlight the challenges affecting the implementation of Service-Oriented Architecture* – Table 6.1 presents a summary of the challenges identified in the analysis of the empirical data and the theoretical framework. The right-hand column highlights the references to the *theoretical framework* constructed in Chapter 3. Some of the empirical data does not have a match in the theoretical framework; the possible explanation for this is presented in this chapter.

Table 6.1: Empirical data and the Theory Framework, ordered by category

Category	Challenges	Empirical data from participant	Theoretical framework
Technical	Real time communication	P2, P4	Moreland (2014)
Technical, Management	Making services work together (cooperation)	P1, P2	White (2012)
Technical	Testing services	P2	Simanta (2009)
Technical	Reliability, Assurance of stable service	P3	Simanta (2009)
Technical	Security	P2, P3	Simanta (2009)
Technical, Strategy	Legacy software migration	P1	Moreland (2014), Khadka (2013)
Governance, Strategy	Legacy migration cost estimation	P2, P4	Khadka (2013)
Governance	Governing SOA complexity (including SOA Overhead and Monitoring)	P1, P2, P3 ,P4	Safy (2013), Hsiung (2012), White (2012)
Technical, Strategy	Vendor software customization	P1, P2	Beydoun (2013)
Strategy	Lack of strategy	P1, P4	-
Business Acceptance, Management	Organizational change (including SOA value)	P3, P4	Beydoun (2013)
Business Acceptance	Slow IT adoption	P2, P3	-
Business Acceptance	SOA owner	P1, P3	-

6.1 Management

By management, this thesis refers to the people responsible for controlling and directing the organization's inner processes. The challenges of the management could mean that these people do not understand or are not willing to accept SOA. In this case, management problems mostly arise from a lack of understanding of SOA and poor cooperation between different units.

Management problems were cited by P2, as the SOA control unit was not cooperating with the business-planning unit. P1 presented this as a struggle between the management department and the IT department (architects), in which the management has little understanding of SOA, leading to the technical department taking control of the SOA development. These findings are in line with Beydoun et al. (2013) who highlight similar difficulties in which the executive management struggles with SOA development. The reason, as underlined by Beydoun, could be that in the SOA environment the business requirements are developed independently from the services.

6.2 Technical

A technical challenge represents an overall technical solution challenge behind the SOA implementation. This could be low levels of support for specific technology standards or a technological limitation restricting the organization.

6.2.1 Technical - Migration and Cost Estimate

P1 presented the challenge of estimating the migration cost of the legacy system using SOA. Khadka (2013) found a similar challenge when estimating the cost of migration. Khadka also mentioned the difficulty of reverse engineering the legacy application. By reverse engineering Khadka means the rebuilding of functionality provided by the legacy system under the migration project to SOA. While P1 did not talk about reverse engineering specifically, P1 mentioned a legacy system which must be "*modernized*" using SOA or rebuilt from scratch. Such modernization of a legacy system brings unknown cost factors according to P1, because SOA brings an *overhead*. By overhead P1 meant the extra work and maintenance required to keep the SOA services running.

6.2.2 Technical - Reliability, Security and Testing

P2 and P3 presented a problem with service reliability, security and testing of web services. Simanta et al. (2009) highlight similar challenges, stating that dependency on external e-services is problematic, because of the "black-box" nature of the web services, which means that the infrastructure behind the service is unknown to the user. The code of the web service cannot be verified, and if the service is compromised, this will bring down the entire dependency network. P3 also presented a problem with service reliability and testing. In this case, critically important medical data needs to be available to different facilities in almost real time. Moreover, the specific real-time challenge was also discussed by P4, who cited an instance when there was a need for low-latency response-time from the service, but the technical overhead of SOA made the web service slower. This issue of real-time communication was critical in the research by Moreland Jr (2014), which reported on the US military's use of real-time communication for combat warships. Moreland highlighted the need for more research about the efficiency and challenges of real-time communication for SOA.

6.3 Governance

The governance challenges represent the difficulties in governing services in the organizational IT environment. All of the participants (P1, P2, P3, P4) discussed SOA overheads and the complexity of SOA systems, with the main focus on governance, and estimation of the cost of governance for the complex SOA systems. White et al. (2012) and Hsiung et al. (2012) also reflect on these challenges. These authors discuss the problem of rising complexity as SOA systems develop, as the SOA application may create more maintenance difficulties than the earlier legacy systems it replaces. The reasons for this are the distributed ownership of services, where the documentation might not be available to the maintainers, poor coordination between changes in different services, and difficulties with the compatibilities of SOA applications because they have been constructed in different languages and environments (Hsiung et al., 2012; White et al., 2012). These difficulties were experienced by all of the participants (P1, P2, P3, P4). In the cases of P1 and P4, this may be explained by the reported lack of integration strategies, as services are created "ad hoc", without any strategy. The services are created using different patterns, thus creating many differentiations in the environment which are harder to maintain; such cause and effect is discussed by (White et al., 2012).

P3 presented a problem with SOA governance regarding the identification of who exactly consumes the service; this governance difficulty is also presented by Safy et al. (2013) and Hsiung et al. (2012) who discuss the difficulty of monitoring the services.

Some specific problems, such as the complexity of deciding the granularity of each service, were mentioned by P1. Participant 1 explained that there was a problem with deciding where to stop when creating a service. Moreover, it can be difficult to avoid creating services that might never be used.

6.4 Strategy

The strategy affects the planning of the SOA implementation. Based on the empirical study there is a visible gap in the strategy, support and understanding of SOA on a strategic level; these issues were highlighted by P1, P2 and P4.

According to P1, P2 and P4, because the organizations lack strategy, most of the services are created reactively (ad hoc). Moreover, when new SOA applications are ordered from vendors, these steps are not planned and organizational requirements are not fully understood, which leads to the need for substantial customization of the ordered vendor applications.

6.5 Business Acceptance

Under this category, this thesis lists the following three challenges: "Lack of strategy", "Slow IT adoption" and "SOA owner".

P1, P2 and P3 struggled to secure the acceptance of SOA by both the users and the management. The users may see SOA as a threat, whereby their work could be replaced. P2 stated that some of the new technology initiatives are not applicable because the state organizations are not allowed to take "risks" with new technologies. The positive results are poorly communicated to

the state, thus leading to low budgeting for SOA projects, which leads in turn to IT Architects implementing SOA without the official support or understanding of the management. The "SOA enthusiasts", as P3 called them, are making SOA work in the background when they see it is appropriate, without the management taking notice. The reviewed literature highlights the need for organizational change to gain SOA acceptance and to make organizations understand the value of SOA (Beydoun et al., 2013). The struggle for acceptance along with a lack of strategy from the management, slow IT adoption and SOA owner identification were not identified as specific challenges in the literature.

7 Conclusion

7.1 SOA Challenges Summary

The research question of this thesis was "*What challenges does the public sector face with the implementation of Service-Oriented Architecture?*". To answer the question, semi-structured interviews were conducted with four IT-architects working with SOA in public sector. For the support of the validity of the empirical analysis, the review of papers from 2009 to 2015 was conducted and the papers were summarized into a theoretical framework.

The analysis of the empirical data identified 13 challenges. They are:

- Real-time communication
- Making services work together (cooperation)
- Testing services
- Reliability, Assurance of stable service
- Security
- Legacy software migration
- Legacy migration cost estimation
- Governing SOA complexity (including SOA Overhead and Monitoring)
- Vendor software customization
- Organizational change (including SOA value)
- Lack of strategy
- Slow IT adoption
- SOA owner

The most emphasized challenge mentioned by all participants was the *SOA governance*. The SOA governance stands for the difficulty of assigning responsibility for governing SOA services. It also includes the increased complexity of IT environment when using SOA (SOA Overhead). It should be noted, that the challenge is non-technical, indicating that the difficulties the participants experienced with SOA implementation are associated with strategic planning and governance, and not with the technical solutions themselves.

From the 13 challenges, three were not found in the supporting literature framework. They were the *lack of strategy*; *slow IT adoption* and the identification of *SOA owner* (see right-column in Figure 7.1). The (1) *slow adoption of IT* and thus technologies like SOA are explained by the caution about new technologies common for the government organizations such as Skatteverket. The caution arises from the unwillingness to adopt untested technologies, which leads to slow IT adoption. Another reason for slow adoption is the resistance of employees to SOA, as reported by one participant. The resistance is rooted in fear of being "replaced" by an electronic service. SOA offers a tool of optimizing organizational processes as opposed to the heavily customized legacy systems. Therefore, SOA creates a risk that some employees will have lower workload.

The slow IT adoption may also explain the second identified challenge the (2) *lack of strategy* when creating SOA services. The participants mention the lack of understanding of reasons for using SOA among the managers. The management both lacks the technical knowledge and sees the extra overhead cost of SOA. Such lack of support from the management level leads to cutting funds for supporting SOA in the organization. A possible explanation presented by one

participant is that it is hard to measure the costs and benefits of a single service. From the management level, it is seen as a technological problem and not a way to optimize the organization.

The slow IT adoption and lack of strategy are also connected to the third challenge of (3) *identifying the SOA owner*. There is a lack of technically adept managers capable of taking such a role, whereas the IT-Architects who could take the role are not able to, because they lack managing titles.

SOA Challenges in Theoretical Framework
- Real-time communication
- Making services work together (cooperation)
- Reliability and Testing; Assurance of stable service
- Security
- Legacy software migration
- Legacy migration cost estimation
- Governing SOA complexity and SOA Overhead
- Monitoring services
- Service compatibility (making services work together)

(not identified in Empirical Findings)
- Requirement understanding
- Definition of standards

SOA Challenges in Empirical Findings
- Real-time communication
- Making services work together (cooperation)
- Testing services
- Reliability, Assurance of stable service
- Security
- Legacy software migration
- Legacy migration cost estimation
- Governing SOA complexity (including SOA Overhead and Monitoring)
- Vendor software customization
- Organizational change, SOA value

(not identified in Theoretical Framework)
- Lack of strategy
- Slow IT adoption
- SOA owner

Theoretical Framework challenges not present in Empirical findings
- Requrement understanding
- Definition of standards

Empirical Findings not present in Theoretical Framework
- Lack of strategy
- Slow IT Adoption
- SOA owner

Figure 7.1: SOA Challenges

At the same time, some of the challenges identified in the theoretical framework and supported by the preceding literature, were not found in the empirical analysis. In particular, these challenges were the *requirement understanding* and *definition of SOA standards* (see left-column in Figure 7.1). The challenge requirement understanding was reported for the airline industry by Beydoun et al. (2013). The challenge was shown to arise when companies were ordering SOA services from external parties. A possible explanation of why this challenge was not recognized in the present study is that the interviewed organizations did their development internally. Thus, the same people that developed the service, also created requirements for SOA services. The challenge *definition of standards* is a problem of defining the standard semantics for a service. This challenge was not identified in the interviews, which can be partially explained by the lack of general strategy for SOA development. In particular, the ad-hoc service development without specific strategy left no room for setting standards.

7.2 Future Research

This thesis contributes to the existing literature review by identifying the additional challenges of SOA. Further contributions to the topic could be done. The potential extensions follow.

Firstly, it is hard to argue from the four interviews that the three challenges can be seen as problems specific to the public sector, therefore, further analysis is needed to make clearer conclusions. The perspective research could focus on analyzing whether the roots of these challenges are general problems of IT adoption or are specific to the public sector.

Secondly, the limitation of the present study is that only IT-Architects were interviewed. Further research could conduct interviews with managers to examine the challenges from their point of view.

Appendix A

A1 The Interview Guide

Background about SOA and Participant	- How do you define Service-Oriented Architecture? - Why do you use SOA? - What are the benefits of SOA? - What worries you about SOA? - For how long have you worked with SOA in your Organization? - How many services have you released? - How many SOA services are currently active and running? - Is your Organization innovative?
Technical	- Do you build your services on top of existing Organization processes? - What relationship do you have between your organization processes and modelling SOA? - Do you have some system to help the users find your services? - How do you secure your SOA services? - What technology or software do you use to integrate services built with SOA with your legacy software? - Can you name any technical difficulties with successful SOA implementation? - Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)? - Do you see SOA as a method to reuse software? - Does SOA affect the spending plans of your Organization? (More cost efficient) - Should SOA be based on the organizational model? - Is your Organization facing any challenges right now? - Does SOA aid you to face these challenges and to what level? - How will SOA affect your IT Organization?
Governance	- Do you use any metrics to measure the success of SOA projects? - Can you tell anything about the governance strategy in your Organization? - Was there ever a need to change the IT governance because of SOA?
Management & Strategy	- Who is the main initiator behind SOA implementations? - How do you plan your SOA implementations? - Who has the overall responsibility for SOA in your Organization? (If SOA comes from top-down or bottom-up)

A2 Transcription – P1

Interview by: Phone
Organization: Large government organization

(B) Background= White

(T) Technical   = Azure

(M) Management   = Yellow

(G) Governance   = Gray

(S) Strategy   = Purple

(A) Business acceptance of SOA initiative = Green

1	**How do you define Service-Oriented Architecture?**	
2	Egentligen handlar det om att tänka på vad man erbjuder i form av IT. Att man tänker på det i form av tjänster. Det finns de tydliga principerna som man måste förhålla sig till för vad man kan kalla en tjänst. Man kan inte kalla vad som helst form en tjänst. Det är att dela in sitt IT-stöd i tjänster, oavsett om det är en applikation eller infrastruktur eller vad det är, i en tjänst.	**B**
3	**Why do you use SOA?**	
4	På min organisation handlar det om att kunna dela upp ett stort gigantisk system i mindre moduler. Det är den absolut viktigaste faktorn. Så man kan byta ut del för del och även kunna "deploya" delar av det här gigantiska systemet. Det är integration som är det andra benet, och myndighetssamarbete som är kopplat till det. Det pågår och det ska utvecklas mer och mer. Myndigheten ingår som en del i en process som innefattar ett flertal andra myndigheter. Hela processen ska digitaliseras. En annan sak som driver införandet av SOA är att myndigheten ska kunna erbjuda fler medborgartjänster i framtiden.	**T**
5	**What are the benefits of SOA?**	
6	Återanvändbarheten. Och nästa: Oberoendet. Att man kan byta ut någon del. Ändringshantering. Snabbare förändring. Det har inget egenvärde i sig men om det kommer något bra standardsystem för någon del, en standardprodukt eller ett standardramverk, då kan man byta ut det och jacka in någon del. Sen är det saken med integration. Det är en möjliggörare för att kunna få en tydligare och bättre integration. Att kunna jobba mot en gemensam integrationslösning. Motsvarande en integrationsplattform.	**B**

	Lättare prata utbyte av tjänster, om man ska få samverkan, genom att prata tjänster. Man lyfter sig ifrån implementation. Man har tydliga gränssnitt, det är det viktiga, hur det ser ut under det ska man inte förhålla sig till.	
7	**What worries you about SOA?**	
8	Det absolut svåraste är granulariteten. Hur stora, vad innefattar en tjänst. Var landar man där? Riskerna är att man får ett spagetti av tjänster. Som blir ännu mer spagetti än systemen och hur de hänger ihop. Eller att man tar ett för stort grepp så man gör en massa tjänster som aldrig kommer användas. En återanvändningspotential som inte förverkligas. Tjänster innebär ju en overhead-kostnad. Vi följer inte teorier eller så kring SOA eller mikrotjänster. Vi är rätt pragmatiska. Vi följer behovet vi har. En annan anledning att vi "tjänstefierar" är för att kunna frikoppla nuvarande gränssnitt för att kunna byta ut bit för bit men ändå kunna behålla det nuvarande.	**T,G**
9	**For how long have you worked with SOA in your Organization?**	
10	Påbörjades för 1,5 år sedan.	**B**
11	**How many services have you released?**	
12	Ett 20-tal. Mellan 10 och 20.	**B**
13	**How many SOA services are currently active and running?**	
14	Samma som ovan.	**B**
15	**Is your Organization innovative?**	
16	Nej och ja.	**B**
17	**Do you build your services on top of existing Organization processes?**	
18	Nej, det finns ingen relation mellan dessa modeller. Vi kör "bottom-up" från det redan befintliga systemet. Ser på vad som finns och skapar tjänster. Frikoppling av det här användargränssnittet i första hand.	**B**
19	**Do you have a relationship between your organization processes and modeling of SOA?**	
20	Inte som det ser ut nu. Om man tänker systemet som det är idag, utgångspunkten är att kunna byta ut gränssnittet. Systemet är inte alls processorienterat.	**B**

21	**Do you have some system to help the users find your services?**	
22	Nej, det finns ingen sådan.	**B**
23	**How do you secure your SOA services?**	
24	Nej, det är nästa steg att titta på. Det ligger som en del som ska dra igång om någon månad. Säkerhetsramverket.	**B**
25	**What technology or software do you use to integrate services build with SOA with your legacy software?**	
26	Ren Java	**B**
27	**Can you name any technical difficulties with successful SOA implementation?**	
28	Att man inte jobbar strategiskt med en lösning för integration. Man sätter en sådan plattform på myndigheten och så tror man att man har löst integrationsfrågan. Att man inte likriktar och hittar bra lösningsmönster. Att man inte ser det som ett eget kompetensområde med ett eget behov. Jag driver på för att införa ett ICC. Det är några som jobbar med det nu men mest direkt på lösningsnivå.	**S,G**
29	**Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)?**	
30	Intern.	**B**
31	**Do you see SOA as a method to reuse software?**	
32	Ja, det tycker jag är bland de viktigaste områdena. Där ska man lägga det största krutet på sin SOA-satsning.	**B**
33	**Does SOA effect the spending plans of your Organization? (More cost efficient)**	
34	Ingen förändring.	**B**
35	**Must SOA be based on the Organizational model?**	

36	Inte av hela verksamheten, men absolut av den del som tjänsterna handlar om.	B
37	**Is your Organization facing with any challenges right now?**	
38	Det är saken med myndighetssamarbetet. Att det kommer på plats. Sen är det också saken med att göra den här moderniseringen av det befintliga systemet, så att det verkligen får någon effekt.	T
39	**Does SOA aid you to face these challenges and to what level?**	
40	Det är en förutsättning. Det är inte en möjliggörare utan en förutsättning. Att koppla loss delar, att bryta isär och tydliggöra funktionaliteten. Vad är det vi har och vad kan vi erbjuda andra, och oss själva. Den tydligheten finns inte i nuläget. Man kan också bygga upp tydlighet med dokumentation men vi kan inte fortsätta att använda saker som det hänger ihop idag.	G
41	**How will SOA will affect your IT Organization?**	
42	Jag tror det är att hitta ägarskapet. Att hitta en tydlig ägare för tjänsterna är en kommande utmaning.	A
43	**Do you use any metrics to measure the success of SOA projects?**	
44	Vi är inte där än. Jag vet inte, jag har dålig inblick i det där. Det finns en grundläggande sak man vill uppnå och det är att genomföra release oftare. Nu är det release en gång i halvåret. Vet inte om det är formaliserat som ett mätetal. Att modernisera det här IT-stöder som är 15 år gammalt: Man måste antingen modernisera det eller lägga ner och börja om. Sen hur man ska mäta skillnaden mellan dessa alternativ, det tror jag inte att man har tänkt på.	B
45	**Can you tell anything about the governance strategy in your Organization?**	
46	Jag har inte riktigt insyn på det området. Man styr på väldig detaljnivå här. Detaljstyr på lösningsnivå. Vet inte om SOA hjälper dig bort från det men man får ju hoppas. Det är en kultur som sitter i väggarna. Visioner och målbilder om vart man vill på lång sikt är inte tydligt kommunicerade. Vi arbetar mest med reaktion. Det vi försöker lösa nu med SOA-initiativet är mest de problem som finns i dagens system.	S
47	**Was there ever a need to change the IT governance because of SOA?**	

48	Nej.	**S**
49	**Who is the main driver behind SOA implementations?**	
50	CIO:n. Han tillhör staben under GD:n. Staben ligger ovanför divisionerna. I CIO:ns grupp ingår en IT-strateg, en IT-arkitekt och en verksamhetsarkitekt. Dessa jobbar sedan tillsammans med IT-arkitekterna som är på IT-avdelningen.	**B**
51	**How do you plan your SOA implementations?**	
52	Nej, ingen plan men man har påbörjat diskussionen lite smått.	**B**
53	**Who has the overall responsibility for SOA in your Organization?**	
54	IT. Verksamheten har ansvar för att ställa kraven men det är IT som har ansvaret att leverera. Om man ska vara mer specifik är det hos ICC det landar när man har det på plats.	**B**

A3 Transcription – P2

Interview by: Phone
Organization: Skatteverket

(B) Background= White

(T) Technical　　= <mark>Azure</mark>

(M) Management　　　　　　= <mark>Yellow</mark>

(G) Governance　　　　　　= Gray

(S) Strategy　　　　　　　= <mark>Purple</mark>

(A) Business acceptance of SOA initiative = <mark>Green</mark>

1	**How do you define Service-Oriented Architecture?**	
	Ja, min definition är först och främst att du ska ha tjänster som sådana. Löst kopplade. Baserade på verksamhetsobjekt. Egentligen både verksamhets- och teknikobjekt. Det är business, affären, som ska styra behovet istället för tekniken. Sen ingår ett antal tekniker i det. En servicebuss hör definitivt hemma i en SOA-arkitektur. Man kan lösa det på andra sätt men det känns som ett av fundamenten. Servicebuss gör inte SOA, men SOA har svårt att fungera utan en servicebuss. Det är också att att man har hela tjänste-governance på plats, så att man hantera sina tjänster. Att man har hela förmågan på plats så att man kan orkestrera. Inte bara tjänster utan att man kan hantera livscykeln också. Det är viktigt att säga att web services är inte SOA. Web services är en teknik för SOA. SOA är ett arkitekturmönster och inget annat.	**T,G**
2	Att kunna monitorera och mäta ingår definitivt också.	
3	**Why do you use SOA?**	
	Ja, nu är jag rätt ny här men jag skulle säga: att minska komplexitet. Det är om jag ska säga en sak som i sin tur ger en effektivare verksamhet. Som ger effektmål, time to market. Nu gäller det inte här men du vet vad jag menar. Affärsdrivet, inte teknikdrivet.	B
4		
5	**What are the benefits of SOA?**	
	Nu är jag ny här men från andra organisationer jag har arbetat i: Om man kommer till en hög grad av SOA, om man har en förändringsprocess. Man möjliggör att byta ut system. Lösa kopplingar. Man måste skilja på implementation och tjänst. Om du gjort rätt kan du byta ut system och funktioner mer enkelt än om man väver ihop allt. Du kan skapa spagetti med SOA-approachen men då har man gjort fel. En bra SOA är väldigt smidig att jobba i. Du får en komplexitet i form av att man måste kunna den, man måste beskriva den. Men om man vet det och vet var man har sina förmågor blir det lättare att hantera förändring.	G
6		

7	**What worries you about SOA?**	
8	Jag skulle inte säga bekymmer men utmaningar. Där har du dels finansieringsbiten: Vem som står för konton, o.s.v. En klassiker i SOA-införande. Det är definitivt en utmaning här. En nyttjare vill ha en tjänst, men du har en tillhandahållare som ska göra jobbet. En annan sak är att få med verksamheten på det. Så att det inte blir något IT-drivet. Då blir det sällan något bra. Då blir det bara lättare tjänster som abstraherar rådata, höll jag på att säga. En stor organisatorisk utmaning. Båda dom två relaterar till organisatoriska utmaningar, mer än till teknikutmaningar. Teknik är så mogen nu att det finns stöd för det man måste göra i den här världen. Sen hur man får till processerna... Jag har varit med på ställen där man bara har plockat in systemen men så blir det pannkaka av det. Här har man så man tittar på SOA-bitarna. Vi har den medvetenheten i alla fall. Att vara ute och missionera och få in verksamheten på rätt spår... Så de ser fördelarna med det. Om de inte ser fördelarna med det... Det är svårt att tvinga in folk och projekt i lösningar.	**G, A**
9	**For how long have you worked with SOA in your Organization?**	
10	Det är fortfarande i projektanalys.	**B**
11	**How many services have you released?**	
12	0	**B**
13	**How many SOA services are currently active and running?**	
14	0	**B**
15	**Is your Organization innovative?**	
16	Både ja och nej. Det finns ett väldigt arv. Det är en bromskloss i organisationen. Om man tittar på hur vi gjort på webben: Det finns en stor grad av innovation där. E-kanalen ligger väldigt långt i framkant. Det är en tvådelad fråga där: Vissa andra gejer görs på ett gammalmodigt sätt. Med det är en konsekvens av vilka vi är. Vi får inte ligga på bleeding edge. Vi får inte chansa. Det finns hög kompetens inom säkerhet: Där är vi långt framme.	**M**
17	**Do you build your services on top of existing Organization processes?**	
18	Ja, det är tanken. Vi ska göra det. Vi har börjat infomodellera för att se vilka bitar man kan komma åt via tjänster. Där har vi tjuvstartat lite grann.	**B**
19	**Do you have a relationship between your organization processes and modeling of SOA?**	

20	Nej, de är ett eget projekt. De som sitter med BPM grejerna. SOA ICC ligger helt fristående från det. Hur vi ska jobba tillsammans framåt, det måste arbetas ut. BPEL och ICC jobbar inte ihop. ICC finns inte här ännu. Det är ett projekt. När organisationerna övergår till en organisation är allt det här utrett. Många puckar som ska redas ut. BPM-bitarna har varit helt knutna till ärendehanteringsdomänen. SOA-tänket handlar mångt och mycket om routing i servicebussen, istället för långvariga processer som ligger i ärendehanteringen. Vi ska kunna routa och enricha och sådana saker. Vi säger heller inte att vi inför SOA utan vi säger att vi inför en tjänsteorienterad arkitektur enligt Skatteverkets riktlinjer.	M
21	**Do you have some system to help the users find your services?**	
22	Ja, det finns ett sådant tänk. Vi har inte bestämt oss hur än.	B
23	**How do you secure your SOA services?**	
24	Det är inte spikat än. Om det är något som finns är det säkerhet. Det finns säkerhet på precis varje nivå man kan tänka sig. Vi jobbar på hur man ska göra med SOA. Vi inför en helt ny nätverksplattform för tillfället. I det ingår att segmentera och skydda segmenten så man inte behöver skicka med certifikat precis överallt. Säkert är det, men vi vill göra det lättare. I nuläget är det både ett hårt skal och hårt internt. Men inget är alltså bestämt eller spikat utan vi tittar på vad som går att göra och hur det uppfyller de krav vi har på säkerhet.	T
25	**What technology or software do you use to integrate services build with SOA with your legacy software?**	
26	Vi har inte valt lösning än.	
27	**Can you name any technical difficulties with successful SOA implementation?**	
28	Jag vill påstå att det är om vi väljer en produkt som är lite kantig mot omgivningen. Att det krävs mycket anpassningar för att passa med resten av miljön. Att det behövs en hel del specialanpassningar. Att det blir en trög övergång. Att servicebussen sitter på en teknik från ett företag och resten kommer från ett annat företag: det blir anpassningar. Mer eller mindre beroende på vilken produkt man väljer. Vi har inte valt produkt för de bitarna än.	T
29	**Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)?**	

30	Vi kommer att göra det internt. Det är planen.	**B**
31	**Do you see SOA as a method to reuse software?**	
32	Nej, SOA är en arkitektur. Om det blir det beror på hur man implementerar arkitekturen.	**B**
33	**Does SOA effect the spending plans of your Organization? (More cost efficient)**	
34	Jag tror vi får en puckel, och förhoppningsvis att det sjunker framöver. Det är så jag tycker i alla fall. Men det är svårt att genomskåda när det är en statlig verksamhet med deras budgetar.	**S**
35	**Must SOA be based on the Organizational model?**	
36	Ja, det vore ju väldigt trevligt om det gick. I praktiken, i större organisationer är det knappt görbart. Det är en vacker tanke dock.	**B**
37	**Is your Organization facing with any challenges right now?**	
38	Det är en ständig utmaning med att styra in folk på e-vägen. Både medborgare till myndigheter och mellan myndigheter och företag. Kan spara hur mycket pengar som helst när man börjar göra det automatiserat.	**B**
39	**Does SOA aid you to face these challenges and to what level?**	
40	Det är definitivt en stor grej i det. Om vi kan göra tjänster med en snabbare time to market underlättar vi med business to business, business to authority, att få allt sådant där att flyta smidigt. SOA spelar en stor roll i det.	**B**
41	**How will SOA will affect your IT Organization?**	
42	Ja, jag tror att vi kommer att behöva samspela mer.	**M**

43	**Do you use any metrics to measure the success of SOA projects?**	
44	Man har planer på att använda mätetal men man har inte kommit så mycket längre än just till planer. Vi har en grupp som sitter och jobbar praktiskt med det här införandeprojektet. Det är mycket som är på väg att tas fram. Men mäta ska vi göra.	**B**
45	**Can you tell anything about the governance strategy in your Organization?**	
46	Vi har en IT-strategi, absolut. SOA har funnits med som en punkt i den i flera år. Det är först nu som det börjar ta fart.	**S**
47	**Was there ever a need to change the IT governance because of SOA?**	
48	Jag vet inte. Vi borde göra det. Hur det blir är frågan. Det är jättemånga processer som påverkas av det här. Alla är inte med och förstår det än. Dels governance-biten, dels hur man testar: Man måste lära sig att testa tjänster och lära sig att de är autonoma. Att man testar förmågan, man behöver inte testa allt hela tiden. Det handlar mycket om personer. Gör man punkt till punkt är det väldigt lätt att förstå. Man vet precis vad det är. Det kommer definitivt att påverka men hur det kommer att förändras återstår att se.	**A,T**
49	**Who is the main driver behind SOA implementations?**	
50	Största eldsjälen: Jag tror att det är vi som jobbar med det. Det är jag och Jens Persson som sitter med det. Direktivet kommer ju uppifrån. Chefsarkitekten är definitivt väldigt på. Chefsarkitekten sitter med i IT-styrningen. Det är naturligt så att det är vi som jobbar med det blir mest entusiastiska. Det är mycket på arkitektursidan som engagemanget finns. Men det är även från sådana som känner till det på projektsidan. Det är en hel del som är intresserade och som vill ha lösare kopplingar. Om man ser på hur SOA växte fram så var det mycket ur ett tekniskt perspektiv. Arkitekturfunktionen är faktiskt ganska självständig. Vi som är arkitekter sitter utspridda på olika sektioner. Vi är inte samlade organisatoriskt. Men man håller på att ändrar om så det är lite rörigt. Olika arkitekter ligger knutna till olika delar. En del är knutna till verksamheten och del till IT. Det finns fyra huvudarkitekter: verksamhet, information, teknik och applikation. Under det finns det en del arkitekter som spänner över de här områdena. Exempelvis som jag, som sitter inom integration och spänner över teknik och applikation. Jag jobbar med verksamhetsarkitekter när det gäller information. Säkerhet spänner också över ganska mycket. Man har olika ansvarsområden. Under det finns de vanliga lösningsarkitektkerna. Man kan säga att de övre skikten håller på med EA medan det är mer praktiskt under dem där man ser på projektens behov.	**B**
51	**How do you plan your SOA implementations?**	
52	Den biten finns faktiskt inne. Vi har Oracle-biten inne för ärendehanteringsprocesserna. Det finns tjänster där men jag har inte varit inblandad i den biten än. När jag säger att vi inte har SOA, menar jag att vi inte har en tjänstebaserad arkitektur. Det finns tjänster. Vi har services. Vi har massor av gamla tjänster där en del exponeras som web services. Det finns tjänster men inte en SOA på riktigt.	**B**

	När vi tänker E-tjänster finns det tjänster för det. Man har inte bara enablat gamla funktioner på tjänster. När det gäller BPL och orkestrering för det. När det gäller Ärendehanteringsramverken. Det finns SOA och till viss del REST.	
53	**Who has the overall responsibility for SOA in your Organization?**	
54	Vi kommer att ha ett ICC. De lär ha ansvar för en hel del. Exakt hur, det låter jag vara osagt.	**B**

A4 Transcription – P3

Interview by: Phone
Organization: Swedish county (landsting)

(B) Background= White

(T) Technical　　= <mark>Azure</mark>

(M) Management　　　　　　　　= <mark>Yellow</mark>

(G) Governance　　　　　　　= <mark>Gray</mark>

(S) Strategy　　　　　　　　= <mark>Purple</mark>

(A) Business acceptance of SOA initiative = <mark>Green</mark>

1	**How do you define Service-Oriented Architecture?**	
2	Att du har tjänster som du har publicerat. Att de kan konsumeras oberoende av teknisk plattform. I vårt fall är det vår integrationsplattform som förmedlar dem. Det möjliggör ett tekniskt oberoende. Att det är en tekniskt lös koppling.	B
3	**Why do you use SOA?**	
4	Tillgängliggörandet av information. Inte bara Create, Read, Update, Delete. Att kunna sprida och tillgängliggöra information oberoende av teknik. Det är det viktigaste. Man måste tillgängliggöra för alla att koppla upp sig. Det är ett slags rörläggeri, infrastruktur. Det är att se till att vatten kommer fram till alla. Eller el. Och att alla kan skicka vatten dessutom.	B
5	**What are the benefits of SOA?**	
6	Effektivitet. Rationalitet. Det är en fast infrastruktur. En standard. Det är inte standard egentligen, utan adaptrar. Det är en adaption till verkligheten som är rationell. Som inte styrs av eller är beroende av teknisk utveckling. Måste förtydliga att standards är för att tillgängligöra. Integrationsplattform möjligör en översättning då det behövs. I den bästa av världar hade det inte behövts men så är det. Det är styrkan i en integrationsplattform.	B
7	**Do you have any worries about SOA?**	
8	<mark>Det enskilt största är ju förståelse. Vi kämpar och försöker kommunicera värdet av detta. IT-mognaden är tyvärr otroligt låg.</mark> <mark>Vi ser att leverantören kommer med jättefina lösningar, men mottagaren förstår inte. Man är inte mogna för helhetsperspektivet. Man har ingen förmåga att se helheten. De är inte mottagliga helt enkelt. Många av dem är sprungna ur vården och är inte kunniga inom IT. De greppar inte. Man får prata med dem i termer som är väldigt långt borta från vår verklighet.</mark> <mark>Det leder tyvärr till att man inte får pengar till det man vill göra.</mark> <mark>Man är rädda för förändringar. Man är väldigt rädda att förlora en position som de känner att de hade.</mark>	A
9	**For how long have you worked with SOA in your Organization?**	
10	Jag började i november 2010. Minst då. Då drev jag igång det.	B

11	**How many services have you released?**	
12	Om man bara tänker SOA finns de tillgängliga hos Inera eftersom alla är nationella (ungefär 170 stycken). Om man tar alla tjänster är det över 1000.	B
13	**How many SOA services are currently active and running?**	
14	Fråga ej relevant.	B
15	**Is your Organization innovative?**	
16	ICC var synnerligen innovativa. IT-strategerna var innovativa. IT som helhet är en gammal organisation med mycket baggage.	B
17	**Do you build your services on top of existing Organization processes?**	
18	De håller på med det. De försöker få ihop det på något sätt. Det går trögt. Öar finns, som till exempel fakturahantering och att betala för vård som utförts i andra landsting.	A
19	**Do you have a relationship between your organization processes and modelling of SOA?**	
20	Ja, det är kopplat. Det finns ingen helhetssyn. Man har inte kommit längre än till infrastruktur. Man kan göra det på små öar, det går ju. Man skulle kunna tänka sig att man efter hand kopplar upp en BPM lösning. Då kan man få det att hända. De håller på med det.	A
21	**Do you have some system to help the users find your services?**	
22	TAK är ju det. Ja, den fungerar också på nationell nivå.	B
23	**How do you secure your SOA services?**	
24	SITHS-certifikat.	B
25	**What technology or software do you use to integrate services build with SOA with your legacy software?**	
26	De har byggt upp detta själva. De är mycket duktiga på det. Det finns adaptrar för nästan allting. Det finns fantastisk monitorering.	B
27	**Can you name any technical difficulties with successful SOA implementation?**	
28	Nej, fanns inga tekniska hinder.	B
29	**Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)?**	
30	Intern.	B

31	**Do you see SOA as a method to reuse software?**	
32	Ja, det är det. Det är nästan det som går över hela diskussionen. Det är kanonbra om man kan ut-veckla tjänster som andra kan återanvända. Till och med olika versioner av dem. Men det går igen i all programmering på högre nivå.	B
33	**Does SOA effect the spending plans of your Organization? (More cost efficient)**	
34	Det måste jag tro. Allt det som staten säger att de ska göra: Patientöversikt, användning av läke-medel, och så vidare. Det är ju detta. Man satsar pengar för att vinna något. Det handlar om rationalisering. Vi har en hel IT-avdelning som bara sitter och pillar med handpå-läggning. De skickar filer hit och dit. De kommer att försvinna när vi inför SOA. Det är rational-isering det handlar om. Då kan vi anställa några sjuksköterskor till.	A
35	**Must SOA be based on the Organizational model?**	
36	Nej. Jag är mycket för "tänk stort, starta smått".	B
37	**Is your Organization facing with any challenges right now?**	
38	Det är att öppna upp mot det publika. Att göra sina tjänster publika. Det har med säkerhet att göra. Att publicera tjänster som har med folks journaler att göra till exempel. Att kunna interagera med folks iPad och armband. Det är det enskilt viktigaste.	T
39	**Does SOA aid you to face these challenges and to what level?**	
40	Absolut. Det är ett av de tilläggsvärden vi kan få. Det är kopplat till de tre första frågorna. Detta är saker som inte kunde göras tidigare. De som är otåliga har redan skapat dessa communities. De kommunicerar med dem. Om du har något hälsoproblem rapporterar de in. Det är öar utanför det offentliga. Sjukvården har inte riktigt hängt med. Vi kämpade för detta i 2-3 år. Man ser möjlig-heterna. Då bör man göra tjänster. Det ska vara tekniskt öppet för alla teknikplattformar.	A
41	**How will SOA will affect your IT Organization?**	
42	I min avdelning var SOA den enda utmaningen. Om man sen ser på IT som stort: En stor del av det man förmedlar kommer att basera sig på tjänsteorienterat. Jag vet inte hur det skulle fungera på ett annat sätt. Om man till exempel ser på tillfälliga personnummer i sjukvården. Det är först och främst viktigt att kunna identifiera patienter som inte råkar ha ett svenskt personnummer. De får ett temporärt ID. När det är akutvård är det snabba ryck. Det kan vara en hjärtoperation, födsel och så vidare. Man kanske åker mellan flera sjukhus på kort tid. Då måste detta finnas tillgängligt på varje ställe när man kommer dit.	T
43	**Do you use any metrics to measure the success of SOA projects?**	
44	Nej, inga. De mätetal vi har är de som Inera höll på med. De mäter oss. Det är publikt så det kan du se på. Men det var ingen som refererade internt till det som en framgångsfaktor. Ibland försöker staten ge oss lite pengar om man genomför vissa särskilda initiativ som till exempel elektronisk födelseanmälan.	B
45	**Can you tell anything about the governance strategy in your Organization?**	

46	Det finns en IT-strategi. Jag har själv tagit fram delen av IT-strategin för integration tillsammans med ett bra gäng. Sen finns det för säkerhet, lagring och så vidare.	B
47	**Was there ever a need to change the IT governance because of SOA?**	
48	Det är frågan. Nu tänker jag SOA governance. Grundproblematiken är att den som tillhandahåller måste kunna se vem som konsumerar tjänsterna. Jag försökte skriva ett Word-dokument om vilka krav man kan ställa. Det drev jag. På vissa öar är man duktiga. På HSA-sidan var man duktiga. HSA-id är ju en del av SOA governance. Säkerhetsmekanismen är också en del av det.	G
49	**Who is the main driver behind SOA implementations?**	
50	Arkitekterna. Utan dem hade det inte funnits någonting. Det drivs utan större förståelse hos andra. Vi har etablerat ett ICC (Integration Competence Center) för governance av bl.a SOA. Det finns en funktion som heter IT-strategi. Det är en stabsfunktion med starka personer. De behöver vara det för de har ingen formell makt. Vi som arkitekter försökte prata för governance. Man rättade sig faktiskt lite efter det. Det var av vår egen kraft. Ledningen hade inte märkt skillnad. Det finns oberoende verksamheten men känslan är att de inte har stödet de skulle haft.	A
51	**How do you plan your SOA implementations?**	
52	Det är det vi pratade om. Det går trögt.	A
53	**Who has the overall responsibility for SOA in your Organization?**	
54	Det är inget uttalat. Verksamheten är de som egentligen är ansvariga men de vet inte vad de är ansvariga för. De har någon från IT som de pratar med och som de förlitar sig på.	A

A5 Transcription – P4

Interview by: Phone
Organization: Swedish county (landsting)

(B) Background= White
(T) Technical　　= Azure
(M) Management　　　　　　　= Yellow
(G) Governance　　　　　　= Gray
(S) Strategy　　　　　　　= Purple
(A) Business acceptance of SOA initiative = Green

1	**How do you define Service-Oriented Architecture?**	
2	Egentligen handlar det om en tjänstbaserad leverans. Att man tar med olika tekniska tjänster på en sådan nivå att det går att plocka ihop dem till hela system, för att fylla en funktion. Tänk dig till exempel en bokningstjänst, en rumstjänst, tjänster som tillsammans kan realisera ett bokningssystem. Tanken med SOA-arkitektur är att få ihop dem och bygga dem på ett tillräckligt teknikagnostiskt sätt för att kunna realisera det. Sen finns det saker omkring SOA: att man har ett ICC, att man har integrationsteknik, att man inför governance. Det är saker som ligger utanför SOA-arkitektur sett ur ett teknikperspektiv men som krävs för att man ska kunna arbeta med det på rätt sätt.	B
3	**Why do you use SOA?**	
4	Det är återanvändning av tjänster. Det är standardisering av tjänster för konsolidering och standardisering. Istället för 10 olika bokningssystem så har man en bokningstjänst för alla system att använda. Det vill säga att man har standardisering och återanvändning av den tjänsten.	B
5	**What are the benefits of SOA?**	
6	Det är ju återanvändningen. Möjligen skulle man också kunna lyfta fram time to market för att realisera tjänster. Men det går tillbaka till återanvändningstänket. Man slipper realisera en ny varje gång.	B
7	**What worries you about SOA?**	
8	Största bekymret är governance och förvaltningsbitar. Man behöver ha ett betydligt större helhets- eller produkttänk i förhållande till de saker man realiserar. Det är svårare att ha ett produkttänk kring en samling löst kopplade tjänster. Alla de här tjänsterna behöver förvaltas och livscykel-hanteras oberoende av varandra. Och alla dessa tjänster har ett system kopplat till dem. Om man har lika många realiserade system som när man köper in dem som monoliter, så är det många relationer man måste hålla reda på mellan de grundtjänster man har realiserat. Om man till exempel har en valutaomräkningstjänst så kan det vara många konsumenter som är kopplade till den och de har olika behov. Då måste man livscykelhantera. Man måste tänka på förvaltningen av var och en av dessa, vilket är lättare om man har en monolit: Det är ofta mer väldefinierat vad den är och gör. Det hela beror på vilken skala man arbetar på. Ett stort företag innebär ofta många tjänster, ett litet företag lite tjänster. Det beror på hur många system man ska stödja via sin SOA-arkitektur, hur många tjänster ska man realisera. Ju mer det sväller, ju fler intressenter blir det för hur man sköter livscykelhanteringen för tjänsterna. Ju mer man skalar upp, ju mer skalar man upp problemen.	G

	SOA drivs av IT mer än av verksamheten. Man skulle kunna sammanfatta med att IT-arkitektur innan drevs mer av verksamheten än av IT. Med det menar jag inte att IT inte har jobbat med de här frågorna utan att man har haft mer av en "låt gå" princip. Det har inte funnits en tydlig IT-arkitekturstrategi. Det har indirekt blivit ett driv från verksamhetens sida. Det här gäller i den mån SOA drivs måste man säga.	
9	**For how long have you worked with SOA in your Organization?**	
10	2008.	B
11	**How many services have you released?**	
12	Mellan 10 och 20.	B
13	**How many SOA services are currently active and running?**	
14	Fråga ej relevant.	B
15	**Is your Organization innovative?**	
16	Ja, absolut. Som människor, som individer, som organisation: Visst är den innovativ. På många olika nivåer. Här finns innovation både inom att ta fram medicintekniska produkter, ta fram processer, ta fram nya avtal och att ta fram hur man ska bygga upp arkitekturen.	B
17	**Do you build your services on top of existing Organization processes?**	
18	Det har funnits initiativ. Samordnad vårdplanering, till exempel. Det är en SOA-arkitektur med en verksamhetsprocess ovanpå. Men det finns ingen uttalad strategi om att system ska implementeras på den nivån nu i Region Skåne.	B
19	**Do you have a relationship between your organization processes and modelling of SOA?**	
20	I och med att det inte finns någon verksamhetsmodellering så finns det inget samband.	B
21	**Do you have some system to help the users find your services?**	
22	Nej. Bara på diskussionsplanet.	B
23	**How do you secure your SOA services?**	
24	PKI, SSL, SITHS-certifikat.	B
25	**What technology or software do you use to integrate services build with SOA with your legacy software?**	

26	Det är adapters som man bygger.	B
27	**Can you name any technical difficulties with successful SOA implementation?**	
28	Det är svårt. På ett icke-tekniskt plan är den största utmaningen governance. Och leverantörskontrakt. Leverantörer av mjukvaror eller produkter vill inte publicera ett gränssnitt så man själv kan bygga återanvändbara tjänster. Det enda tekniska som jag kan tänka mig är kopplat till svarstider och konnektivitet. Det är om man tänker realtidsapplikationer. Det är den extra latency som en extra plattform innebär. Det blir alltid en del overhead som kostar en del i tid. Ytterligare ett är att man ökar komplexiteten i lösningarna i samband med en SOA-plattform. Det blir mer att förvalta. Det blir en till spelare med i bilden.	G, T
29	**Do you build your SOA services yourself or outsource it to other Organizations (or parts of organization)?**	
30	Som det är nu är det internt byggd. Det är om man tänker förvaltning och övergripande styrning av SOA-plattformen. Om man tänker bredare än så kan man säga att det är en mix.	B
31	**Do you see SOA as a method to reuse software?**	
32	Ja, det kan man säga. Övergripande kan man säga så. Det är om man inför SOA i organisationen. Men om man har en leverantör som inför SOA i sin produkt är det de snarare än kunden som skördar frukterna.	B
33	**Does SOA effect the spending plans of your Organization? (More cost efficient)**	
34	Ja, i och med att man återanvänder kan man minska IT-investeringarna till viss del. Det har redan påverkat som sagt. Sen påverkar det så klart också med mer overhead: De tjänster man tar fram blir lite dyrare att ta fram än de skulle vara i en icke SOA-arkitektur.	S
35	**Must SOA be based on the Organizational model?**	
36	Ja, absolut. Det är väldigt viktigt för att man ska kunna lyckas med en SOA-arkitektur, om man kör det fullt ut.	B
37	**Is your Organization facing with any challenges right now?**	
38	Konsolidering av system är en sak man pratar om. Men grunden är kostnadsbesparingar och likriktning av processer. Det är en kostnadsdrivande faktor att ha divergerande verksamhetsprocesser. Det i sin tur kommer att leda till att man behöver likrikta processerna och sedan konsolidera system.	B
39	**Does SOA aid you to face these challenges and to what level?**	
40	Det är genom återanvändning av tjänster som det är det lättare att konsolidera olika processer. Genom att man inte sprider information på olika sätt. Det beror så klart på hur man har realiserat SOA-arkitekturen. Det skulle kunna stödja genom att det blir en enklare konsolidering på IT-sidan.	B
41	**How will SOA will affect your IT Organization?**	

42	En SOA-arkitektur kräver en lite annan organisation. Det är inte en monolit man har utan det är mindre tjänster som man förvaltar. Tjänsteförvaltarskapet, som man är van vid att se det, är baserat på att man har ett system att ta hand om, som till exempel en monolit eller en client-server-lösning. Går man istället mot en SOA-arkitektur är det något som kräver förvaltning av separata tjänster. Sett ur ett driftsperspektiv kommer det att vara en plattform som håller ihop SOA-arkitekturen och som blir central för alla tjänster som man bygger på SOA-arkitekturen.	G
43	**Do you use any metrics to measure the success of SOA projects?**	
44	Nej. Det finns ingen uttalad strategi eller mätetal för detta inom Region Skåne. Det är mer baserat på best practice.	B
45	**Can you tell anything about the governance strategy in your Organization?**	
46	Relaterat till detta finns det ingen verksamhetsstrategi som stödjer SOA eller den tekniska sidan av IT. Tekniskt sett har vi en integrationsstrategi som lutar sig mot SOA. I IT-strategin som helhet säger man varken bu eller bä om SOA. Man skulle kunna spjälka ut vissa delar som man kan tyda som att man rör sig mot en SOA-arkitektur, men det är inget uttalat.	S
47	**Was there ever a need to change the IT governance because of SOA?**	
48	I och med att vi inte har någon SOA införd i den bemärkelsen: Inte på grund av det utan det är andra faktorer som spelar in. Det är lite bakvänt, i så fall skulle det vara SOA som driver strategin och var man är på väg.	B
49	**Who is the main driver behind SOA implementations?**	
50	Det är arkitekterna. Chefsarkitekten. Det är han som har drivit det i huvudsak.	B
51	**How do you plan your SOA implementations?**	
52	Nej.	B
53	**Who has the overall responsibility for SOA in your Organization?**	
54	Först och främst IT. I så fall förvaltaren av tjänsteplattformen eller chefsarkitekten, beroende på vad man menar.	B

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