

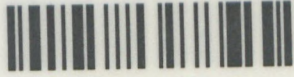
THE ROLE OF SERVICE-ORIENTED
ARCHITECTURE AS AN ENABLER
FOR ENTERPRISE ARCHITECTURE

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**The Role of Service-Oriented Architecture as an enabler for
Enterprise Architecture**

By

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Abstract

The adoption of Enterprise Architecture (EA) methodologies within organizations is causing an interest in the methodologies and supporting technologies available. Service Oriented Architecture (SOA) supports EA in many facets. However, there is much suspension with regard to the relationship between EA and SOA within organizations as well as the guidelines that organisations should follow in order for SOA to enable EA. There are potential problems that may arise if this relationship between SOA and EA is not agreed to at the outset of implementing an EA. The purpose of this research is to investigate the guidelines that are needed for SOA to enable EA, in order to provide practical steps that organisations can use to begin aligning SOA and EA, ensuring that these initiatives are driven from a business perspective. A qualitative approach using a case study was used as a methodology for this research. The data collection was conducted using semi-structured interviews, and the guidelines that were derived were validated through a survey that was distributed to industry architecture practitioners. The contribution of this research was a set of guidelines that can be used for SOA to enable EA. Further research areas were highlighted, including investigating the mapping of the guidelines that were derived from this research, into the EA frameworks that exist such as TOGAF and ZACHMAN.

Keywords: Enterprise architecture; Service Oriented Architecture; Relationship between Enterprise architecture and Service Oriented Architecture; Guidelines for SOA to enable EA.

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1. Introduction

The purpose of this research was to investigate the role that Service Oriented Architecture (SOA) plays as an enabler for Enterprise Architecture (EA). Traditional EA focuses on the crafting of a plan and not the implementation of a solution whereas SOA focuses on the implementation once the planning was done (Linthicum, 2008). The purpose of EA is to define the entire organisation in the context of its people, processes and technologies (Sessions, 2007). SOA is a means of implementing the capabilities of an organisation, in a reusable manner, that allows for the creation of an agile organisation (Homann, 2006). Although both concepts have been in industry for a significant period, EA longer than SOA, there still seems to be confusion as to roles of each and how they relate to each other or even whether they relate to each other at all.

Lapalme (2011 :5) discusses three schools of EA and defines them as follows:

- a. "Enterprise Information Technology (IT) Architecting School – EA as the glue between business and IT.
- b. Enterprise Integrating School – EA as the link between strategy and execution.
- c. Enterprise Ecological Adaptation School – EA as means for organisational innovation and sustainability".

As organisations mature in their understanding of business and IT alignment, they begin to evolve between the different schools up until the point where EA becomes a means for organisational innovation. The premise used as a basis for this research was that EA is used to align business and IT from a strategic perspective and SOA is used to align business and IT from an execution perspective which is aligned to school a and b as highlighted above.

Linthicum (2008:1) highlighted the following issues as some of the major contributors to the confusion between the role of SOA and the role of EA:

- "Traditional EA focuses on the creation of a strategy rather than implementing a strategy. SOA addresses the implementation after the planning has occurred.
- Traditional EA is not funded for implementation; the focus is on the creation of the strategy, the plan or the means with which to move an organization forward strategically. Moreover, many enterprise architects just seem to serve as the resident guru and hold no real political or budgetary power.
- Traditional EA is leveraging well-defined processes, approaches, and methodologies that in some instances are difficult to map into SOA."

This research focused on the above mentioned issues as outlined by Linthicum (2008), with the goal to investigate the role that Service Oriented Architecture (SOA) plays as an enabler for Enterprise Architecture (EA) and to provide a set of guidelines that can be used by organisations and practitioners to enable their EA efforts.

Both SOA and EA are distinct frameworks that share a number of common goals, the most noticeable being the fact that they both promise improved interoperability as well as better alignment of business strategy and Information Technology (IT) solutions (Seppanen, 2008). Although both EA and SOA focus on aligning business and IT, the alignment is achieved through different mechanisms each of equal importance in achieving the vision of business and IT alignment.

The aim of this research was to provide an understanding of the strategic role that SOA plays in enabling EA, as well as to propose a set of guidelines to implement EA using SOA.

1.1. Background

Most EA implementations aim to address the alignment between IT and Business from a strategy perspective; however there is very little emphasis on the alignment between IT and business from a technology perspective. The focus is almost always on alignment and flexibility rather than on agility (Schelp & Aier, 2009). IT has a reputation for not being able to provide a clear indication of which business drivers or vision the technology investment supports from a business perspective (Peppard, 2010). This is apparent in almost all IT divisions where CIO's are constantly asked to cut their budgets by more and more each year without jeopardising the services provided to business, but rather providing new and better services (Tynan, 2011).

The ability to solve technical integration problems is not enough to justify an investment in terms of funding, organisations want more (Homann, 2006). Every technology investment needs to be justified and aligned to a business imperative or else CIO's will continually be asked to trim their budgets (Tynan, 2011). Whether it is electronic monitoring systems in the data centre to the addition of more capacity in the air-conditioning systems, the investment must be driven by the business need. In order to ensure that business need drives IT investment, there needs to be alignment between business and IT both from a strategy and technology perspective. By exploiting the relationship between SOA and EA, this alignment can be created.

The focus of this research was to provide an understanding of the strategic role that SOA plays within EA from both a technology and a business perspective and how organizations can leverage this understanding to their benefit. After looking at industry as well as analysing my past experiences, the perceived lack of guidelines as to how to leverage SOA for EA has led to very few successful implementations, as outlined in the case study in Chapter 4, and this research focused on this aspect as the research problem.

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“Everything we have built in the past 50 years (“the legacy”), and everything we are doing in the present to satisfy current demand, are perceived by management to be hopelessly inadequate.”(Zachman, 2006:1). Organisations are being challenged, to ensure that IT delivers on business requirements, but more importantly to ensure that IT can now provide greater differentiation and competitive advantage in the context of business, as opposed to the traditional supporting role that many IT professionals have become accustomed to. There needs to be a drastic change in the relationship between IT and business, in order to address the challenges that organisations are currently experiencing and will be experiencing in the future. This, however, can only be achieved when IT can demonstrate real business value to organisations. SOA, EA and the relationship between them provide a means to achieve this, by providing a means of defining and implementing business capabilities. However, as highlighted by Linthicum (2008), there is a gap in the literature with regard to the clarity of roles and the relationship between SOA and EA. The aim of this research was to address this gap, and therefore the research investigated the relationship between SOA and EA and the goal was to identify a set of guidelines for using SOA as an enabler for EA in order to ensure that business value is created through technology.

1.2. Research Problem

The research problem that was investigated through this study is that there is a lack of guidelines that support the Enterprise Architect when he or she wants to use SOA in enabling EA. Although both SOA and EA have been in industry for quite some time, there still is debate around how these concepts fit together and whether they should at all. The lack of practical guidance with regards to the relationship between SOA and EA is also an aspect that contributes to the research problem due to the fact that a lack of understanding of the concepts results in confusion with regards to the implementation of these concepts.

This research addressed the aspect of the lack of guidelines for SOA to enable EA by researching the literature as well as conducting a case study in order to elicit practical guidelines that can be used to address the research problem. There is much focus on the issue of practicality throughout this research, as I wanted to ensure that the findings can be used within organisations to assist in addressing the alignment of business and IT through SOA. The next section provides context for the research problem by highlighting the specific research questions that were answered through this research.

1.3. Research Question

As mentioned in the previous section, the research problem that this study focused on is the lack of guidelines for the alignment of IT and business with regards to SOA. In this context, the objectives of the research are to:

- Clarify SOA and EA concepts.
- Investigate the relationship between SOA and EA.
- Compile a set of guidelines both from the literature and from industry practitioners that can assist an organisation in strategic decisions in the use of SOA to enable EA.

The main research question is defined as: **What are the guidelines for Service Oriented Architecture to enable Enterprise Architecture?** In order to answer the main research question, the following sub questions were defined:

- What is the relationship between SOA and EA?
- What are the guidelines for SOA to enable EA according to the literature?
- What are the guidelines for SOA to enable EA according to industry practitioners?

1.4. Research Methodology

The epistemology for this research was an interpretive study that focuses on deriving guidelines for using SOA with EA. Orlikowski and Baroudi (1991:5) state that "Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them."

The research approach used in this research was a qualitative inductive approach where the guidelines were derived from a case study and the literature. Maxwell and Kaplan (2005) provide support for this approach stating that qualitative research methods are primarily inductive where hypotheses are developed during the study so as to take into account what is being learned about the setting and the people in it. Most of the aspects that are discussed in this study are relatively new and thus the research approach required an exploratory analysis of the data with the aim of finding the best suited guidelines in order for SOA to enable EA.

The research strategy used was a combination of a case study as well as the interpretation of secondary data (literature review) (Saunders, Lewis and Thornhill, 1997). According to Yin (2003), the case study approach is appropriate where the researcher's main aim is to draw a list of characteristics but not necessarily conclusions. The main aim of this research was to identify guidelines that could be used for the implementation of SOA in the context of EA, and thus the case study approach was

appropriate to identify the guidelines. For the purpose of this research, the number of cases was limited to one, and this together with the other secondary data provided sufficient information to substantiate the outcome. It was appropriate to do a single case study since I wanted to do an in-depth analysis, which is appropriate for a Master dissertation. In order to generalize the results, more case studies are needed to confirm the guidelines found in this study.

Apart from the above, I have used my own industry experience in the contribution chapter to reflect on the findings with regard to the guidelines retrieved from theory and the case study. Figure 1 provides a graphical view of the research process especially in terms of data collection.

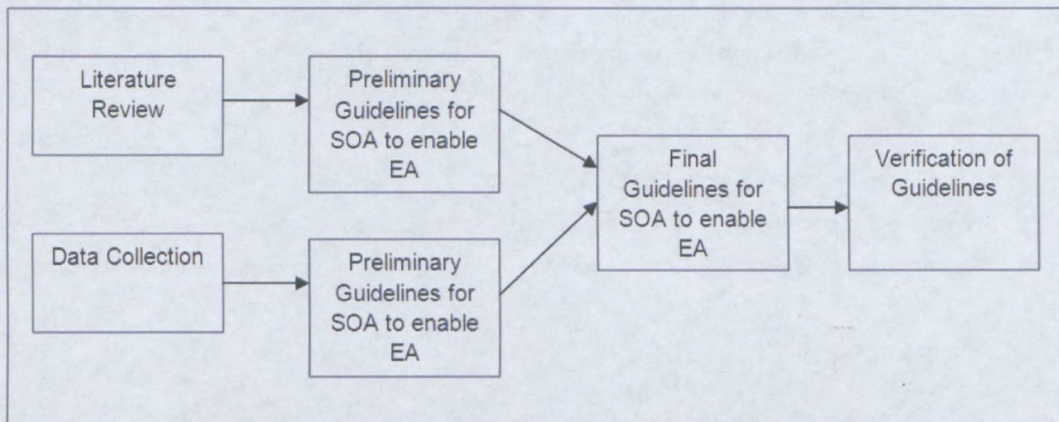


Figure 1: Graphical Representation of Research process with respect to Data Collection

The purpose of Figure 1 is to illustrate that the guidelines were determined based on the input received from both the case study and the literature reviews. The relevant themes were derived based on the above mentioned data collection techniques, and thereafter the links between them were established. In terms of the data collection, a brief discussion of the methods that were used is highlighted below:

- A single case study was carried out at a large financial services organisation in the Western Cape. The organisation had implemented SOA at a technology level and was in the process of implementing EA. The approach was based on Interviews as well as an overview of the completed projects, which was used to support the research findings from the literature study. I interviewed various individuals at different levels of the organization in order to gather information on guidelines for using SOA to enable EA.
- A review of the literature was carried out in order to find links in the text to identify common views that were shared across the expert community. These links were further extrapolated to determine the guidelines as set out in the research problem. This was done by summarising the data collected into a summary document and then finding common themes, by looking at common words, phrases, or common ideas that were shared across multiple authors.

- Once the final guidelines were determined, a survey was sent out to various industry practitioners to determine the feasibility of the guidelines in terms of their applicability to organisations today. I also used my industry experience gained to reflect on feasibility of the guidelines. These aspects were covered as part of the verification step as outlined in Figure 1.

1.5. Scope

The scope of this research included the relationship between SOA and EA with the aim of deriving guidelines for using a SOA approach in the implementation of EA. This research did not evaluate and analyse all of the EA frameworks and SOA approaches, but rather provided an overview of these, as the main focus was on the relationship between SOA and EA and the guidelines for SOA to enable EA.

1.6. Contribution of Research

The focus of the research was to propose practical guidelines that organisations can utilise in aligning both business and IT from a technology perspective, using SOA within the context of EA. The proposed guidelines provided can be used by both SOA and EA practitioners as well as IT executives as a guideline for their SOA and EA initiatives. Furthermore, the guidelines can be used by business representatives as a mechanism to facilitate discussion between their IT teams and themselves, not only in the context of SOA and EA, but also in the context of business and IT alignment.

In this research one of the objectives was to provide an understanding of the relationship between SOA and EA. This relationship is a critical factor in SOA and EA initiatives, and organisations can utilise this understanding to prescribe principles that should be adhered to in their SOA and EA initiatives. Finally, the guidelines identified in this research may act as a starting point for organisations that have not embarked on any EA or SOA projects, and this could potentially lead to a more cost effective approach.

1.6.1. Personal Motivation

This section on industry reflection was one of the motivators for this research to reflect on the research from my perspective. Based on my experience within the IT industry I have found that there are no practical guidelines that we can use in the implementation of SOA within the context of EA, especially from a business perspective. This was also supported by the lack of such guidelines in

literature. SOA in itself has been given a very bad reputation by IT people mainly due to the fact that it has been seen as purely a technical architecture to assist in integration of systems.

The problem that I have also noticed is that very few business executives understand the true meaning and value of SOA because of the technical connotations that have been and still continue to be associated with it. I have included this section in the study to reflect on the guidelines that are produced within the context of my experience with SOA an EA, to attempt to highlight the importance of ensuring that these guidelines focus on the creation of business value, which I believe was the intent of SOA, and that these guidelines will assist in allowing business and IT to align both from a strategy and a technology perspective.

1.7. Publications from this Research

As part of the initial theoretical study done on the relationship between SOA and EA, a review article of the literature was submitted to an IEEE peer-reviewed conference hosted in Vitoria, Brazil. The published detail of the paper is the following:

Kistasamy, C., van der Merwe, A., & de la Harpe, A.C. (2010) The Relationship between Service Oriented Architecture and Enterprise Architecture. Enterprise Distributed Object Computing Conference Workshops (EDOCW), 2010 14th IEEE International. Vitoria, Brazil, IEEE.

The theory on the relationship between SOA and EA used in this article is discussed in more detail in Chapter 2 of this thesis.

1.8. Outline of the Chapters

The structure of this thesis is depicted in Figure 2. Chapter 1 provides a background to the study, the research objectives, the scope and contribution, the research design, and the research question. Chapter 2 provides a review of the literature in the context of the research problem, highlighting the theoretical framework for this study. Chapter 3 focuses on the research design and methodology in detail. Chapter 4 provides the data collected for this study. Chapter 5 focuses on the contribution of the study as well as an analysis of the data in the context of the research problem. Chapter 6 provides a conclusion to the thesis as well as highlights some aspects for further research. This is followed by the References, as well as Appendix A, B, and C, which includes the CD contents, as well as the survey email, and detailed survey results.

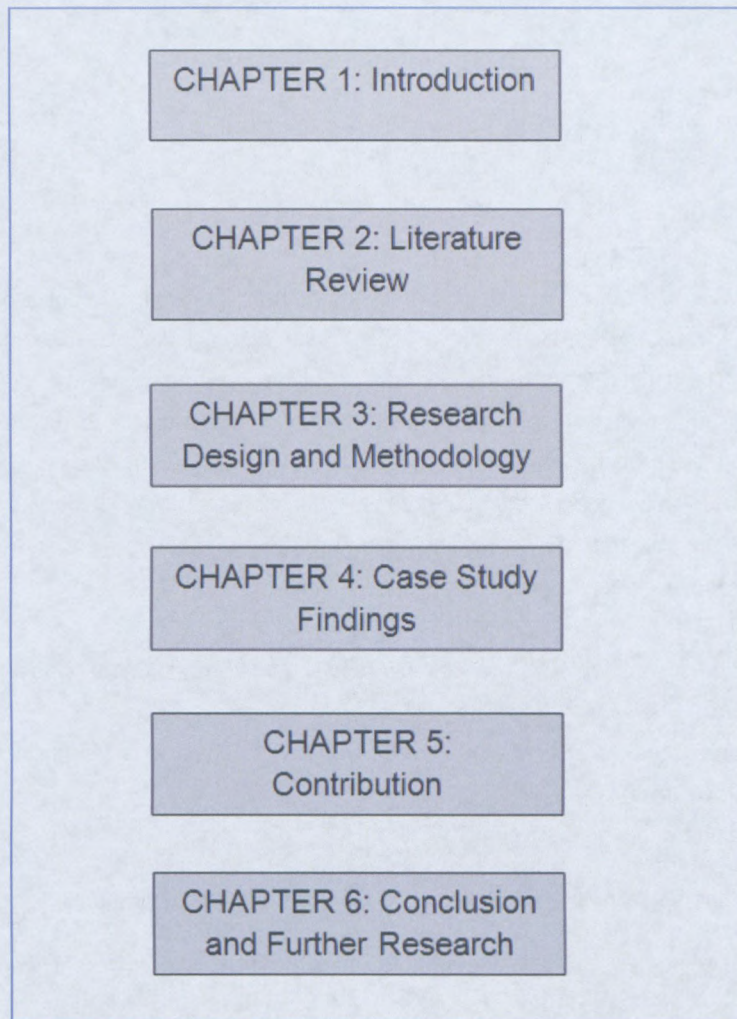


Figure 2: Graphical Representation of Thesis Structure

1.9. Summary

In this chapter the background was provided that puts the problem that was addressed in this thesis in context. An overview was also provided of what the focus of the research is, as well as the research questions that were defined as guidance during the investigation of the main research question, namely: How can Service Oriented Architecture enable Enterprise Architecture?

The research strategy followed to identify the answers to the research question was also briefly addressed in this chapter inclusive of an overview of the process followed. The scope and the contribution of the research were then addressed, highlighting the delineation of the research as well as the outcome of the research. This chapter also referenced the publication documented from the research as well as my personal motivation for this research, and finally a summary of the thesis structure is provided.

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2. Literature Review

2.1. Introduction

The literature review is a means of demonstrating the authors knowledge about a particular area of study, including vocabulary, theories, key variables, phenomena, influential researchers as well as research groups (Randolph, 2009). In relation to this study, a literature review was conducted in order to familiarise the author with the previously documented studies relating to the research problem identified, as well as to provide a theoretical framework on existing work published within this domain. The literature review also addressed the three sub-questions as well as partially contributed to answering the main research question. The following are the research problem, main research question and sub research questions as discussed in Chapter 1:

Research Problem:

There is a lack of guidelines for SOA to enable EA resulting in a misalignment of business and IT.

Research Question:

What are the guidelines for Service Oriented Architecture to enable Enterprise Architecture?

Research Sub-Questions:

- a) What is the relationship between SOA and EA?
- b) What are the guidelines for SOA to enable EA according to the literature?
- c) What are the guidelines for SOA to enable EA according to industry practitioners?

In this chapter research sub-questions a) and b) above are addressed, specifically documenting what the literature states with regards to each of these sub-questions. Figure 3 depicts the structure of Chapter 2, which is broken down into five major sections.

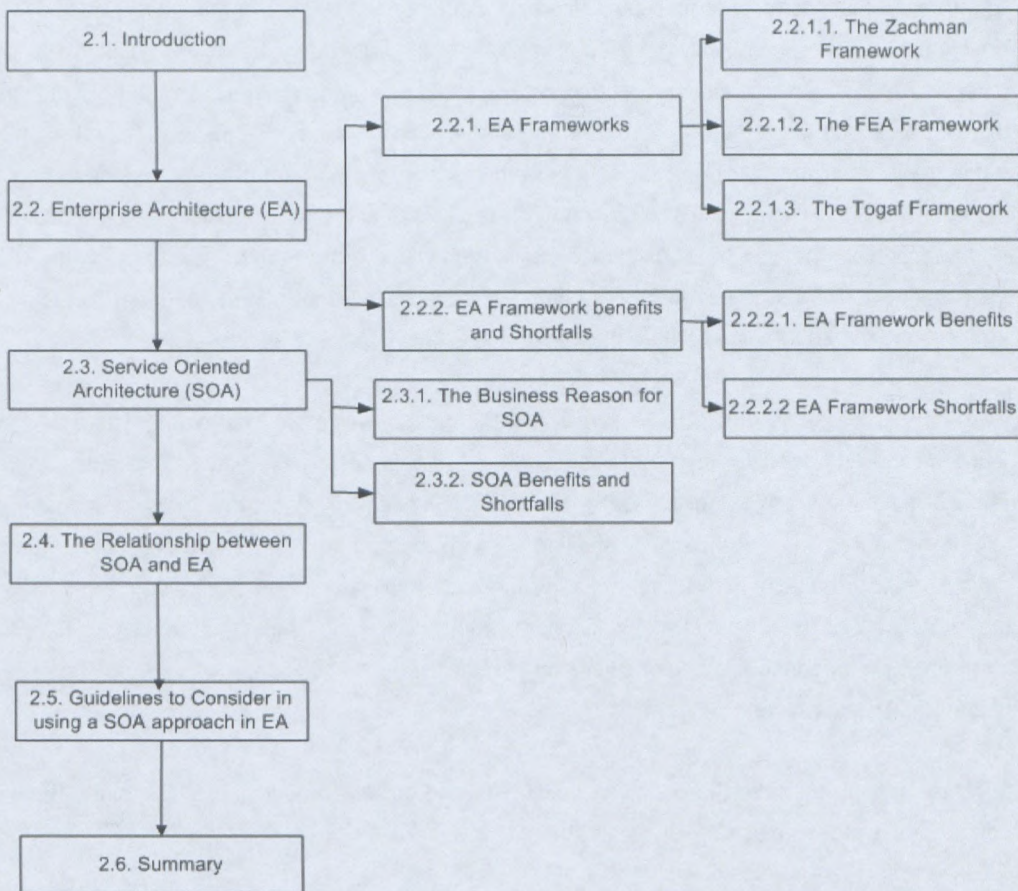


Figure 3: Graphical Representation of Chapter 2

In section 2.2 EA is introduced, some of the frameworks are discussed as well as the benefits and shortfalls of EA. The purpose of section 2.2 is to provide context with regards to the research question that is being investigated. Section 2.3 provides an overview of the concepts relating to SOA. The relationship between SOA and EA is discussed in section 2.4 in order to highlight the synergies between the two concepts. All of the sections previously discussed aim to build the case for section 2.5 where the guidelines to consider in using a SOA approach to implement EA are documented based on the literature reviewed in the previous sections. Finally section 2.6 provides a summary of the chapter.

2.2. Enterprise Architecture (EA)

Enterprise Architecture was first introduced by Zachman in 1987, in order to provide a means to descriptively represent objects in a specific context in order to highlight the relationship between different objects. The increasing complexity of organisations created a need for the ability to represent this complexity in a manner that could be more easily communicated. Townson (2008) highlighted a fundamental challenge facing organisations with regards to alignment between business and IT, and the role that EA can play in creating alignment by describing the relationships between business and IT. Organisations have continuously been challenged with the question of how to justify the IT budget especially when there seems to be very little evidence stating that this supporting function is adding any value to the bottom line of the organisation especially in non- IT businesses.

According to Sessions (2007), EA has been in the industry for more than twenty years and its initial focus was to address two key problems, namely: systems complexity and poor business alignment. There are many variations of the definition of EA (Stenzel, 2007), and even today industry experts still do not agree to one universal definition. However, most definitions include that EA focuses on describing an organisation in terms of its information, applications and technology and linking that to the organisations business strategy (Stenzel, 2007). Enterprise Architecture (EA) has also been identified as a means to aligning business and IT, cost reduction or to facilitate change (Lucke, Krell & Lechner, 2010, Lapalme, 2011).

In terms of this research, the definition below was the preferred definition of EA, since it provides a comprehensive description of EA.

“Enterprise Architecture is about understanding all of the different elements that go to make up the enterprise and how those elements inter-relate. Enterprise Architecture embodies a set of principles, rules, standards and guidelines, expressing and visualising the vision, culture & behaviour of an organisation while implementing certain concepts that serves as prescription for the design and construction of a certain object type. It contains a combination of style, engineering and construction principles, guaranteeing the uniformity and quality of the resulting object.” (Schekkerman, 2006a:2).

A successful Enterprise Architecture should include the following characteristics within an organisation (Gilmour, 2006):

- adherence to the corporate policies
- adherence to the corporate processes
- comply with laws, rules and regulations
- conform to auditable controls.

Table 1 provides a model for enterprise architecture and provides a very clear high level understanding of the different aspects that are involved:

Table 1: Simplified Enterprise Architecture (Anaya & Ortiz, 2005)

	WHAT	HOW	WHERE	WHO	WHEN	WHY
ENTERPRISE MODEL <i>owner</i>	- Resource model - Information model	- Business Process models - Business rules - KPIs	Business logistic System	Organization models	Master Schedule	Business Process Strategy and goals
SYSTEM MODEL <i>Designer</i>	Logical Data model	Application Architecture	Distributed System Architecture	Human Interface Architecture	Processing Structure	- IT goals and system requirements
TECHNOLOGY MODEL <i>builder</i>	Physical Data model	System Design	Technology Architecture	Presentation Architecture	Control Structure	- IT goals, non-functional requirements, budget constraints

Table 1 maps out the content that is required to capture all of the information within an organisation. Although, the complexities of such an endeavour are not displayed within Table 1, the aim is to highlight the types of information that EA represents. There are no prescribed rules in terms of what each organisation should capture from a content perspective as each organisation will be different from the other, but the idea is to have some guidance with regards to the classification of the content. Enterprise architecture frameworks have been used in industry to assist organisations to classify their content when embarking on their EA initiatives. The section that follows provides an overview of some of the EA frameworks, as well as a view of the type on content that these frameworks aim to capture.

2.2.1. EA Frameworks

An enterprise architecture framework (EAF) is a conceptual framework for *describing* the architecture of a business and its information technology (IT), and the relationships between them (Zarvic & Wieringa, 2006). The following sections discuss the EA frameworks in more detail, however the purpose of these frameworks are to provide a guide to organisations in order to document the all of the elements of the organisation, highlighting the relationships between the different elements. These frameworks can assist in enabling EA but EA is much more complex than frameworks, it is about assisting an organisation in facilitating change, and alignment between their resources. Even though there are many well publicised EA frameworks, many organisations create their own custom EA frameworks, specific to the needs of their organisation (Sparx Systems, 2009). In such cases, standard frameworks may not cater for the needs of the organisation, resulting in them creating a custom framework.

Figure 4 depicts the EA timeline from the point of John Zachman's first article in 1987 up until 2006 when the Federal EA was mostly completed. From 2006, there have been more contributors to the field of EA such as SAP with its EA framework, however not much has significantly changed since 2006. By this I mean that the fundamental goal of EA has remained constant from 1987, where organisations are trying to find ways of creating more business value from their IT assets.

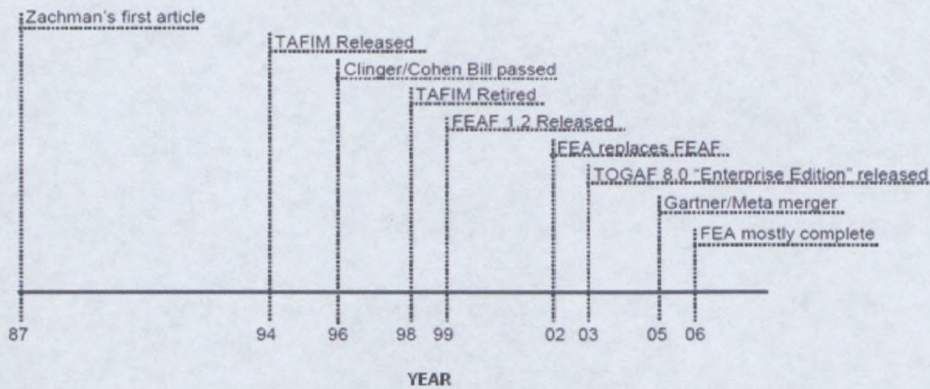


Figure 4: Enterprise Architecture Timeline (Sessions, 2007)¹

Figure 4 highlights some of the major frameworks in industry today, and the next sections discuss three popular frameworks, namely the Zachman Framework, the Federal Enterprise Architecture Framework (FEAF), and The Open Group Architecture Framework (TOGAF). As mentioned in Chapter 1, the scope of this thesis was not to exhaustively evaluate all of the EA frameworks but rather to provide an understanding of EA in the context of the research question; therefore not all of the EA frameworks available were documented, but the aim was to provide a view of what an EA framework aims to achieve.

2.2.1.1. The Zachman Framework

John Zachman is regarded as the individual who introduced information systems architecture (Goethals, 2006), and the Zachman framework is considered a comprehensive tool in describing an organisation. The Zachman Framework is the theory that states that there are predefined representations for describing, designing and building solutions to business challenges by drawing on "two distinct classification systems to define the set of representations that are needed to manage the complexity and change of these objects." (Zachman, 2008). Figure 5 displays the graphical representation of the Zachman framework, as well as all of the dimensions of the framework that need to be taken into account. Schekkerman (2004) described the Zachman framework, as a positioning framework, that allows an organisation to categorise deliverables.

¹ FEA – Federal Enterprise Architecture, TAFIM – Technical Architecture Framework for Information Management

The Zachman Framework for Enterprise Architecture™

The Enterprise Ontology™



Figure 5: Zachman EA Framework (Zachman, 2008)

The first vertical column in Figure 5 deals with the different perspectives of the different stakeholders with regards to the systems development process, and the horizontal dimensions aims to address the questions of What, How, Where, Who, When, and Why, in the context of the different individual perspectives (Goethals, 2006). The Zachman Framework can be used to represent the different perspectives of a single project or even a programme, and in the context of EA, the framework can be used to represent all of the different elements that make up the enterprise, identifying the owners as well as the artefacts that belong to an organisation. According to Zachman (2008) this framework was initially derived from his observations of the descriptive representations of airplane designs as well as building architectures. The framework reflects this aspect as an underlying context as the artefacts that are created describe the context within which they are used.

The main objective of the Zachman framework is to remove duplication and reduce ambiguity when representing an organisation's artefacts (Sessions, 2007). An architectural artefact should, according to the framework, live in only one of the cells as depicted in figure 5, and if there is any ambiguity with regards to a particular cell, then that there is a problem with the cell. The total of all of the cells in the Zachman frameworks equates to 30 cells, which must all be filled out in order to fulfil the requirements of this framework. However, it is in this careful representation of the data, that the benefit of the Zachman framework can be realised, as organisations are forced to ensure the quality of cells being

described. The use of the Zachman framework should be driven by the needs of the organisation to ensure that the population of the framework does not become priority over the output of the exercise, which is to provide a means of aligning business and IT (Bloomberg & Schmelzer, 2006).

2.2.1.2. The FEA Framework

The Federal Enterprise Architecture Framework (FEAF) was developed by the Chief Information Officers (CIO) Council to promote interoperability, shared development of common government processes, and the sharing of information among government agencies within the United States government (Goethals, 2006). Although this framework was developed specifically for the United States government, the principles and artefacts can potentially be applied to EA in general as well due to the fact that this framework also deals with enterprise wide aspects, where the enterprise in this case is the United States government. Figure 6 provides an overview of the FEAF as well as the perspectives that it covers in the framework.

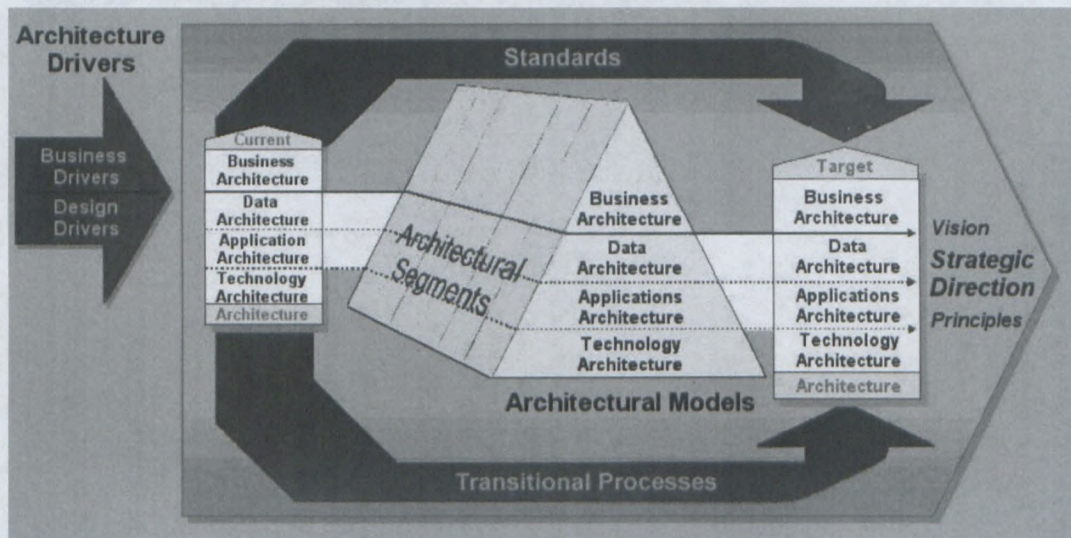


Figure 6: FEAF (Goethals, 2006)

The FEAF also incorporates some aspects of the Zachman framework, specifically, the what, when and why questions. However, the main objective of FEAF is to create a segmented architecture as a subset of the enterprise as a whole (Sessions, 2007). Figure 6 highlights the fact that business drivers are used as input to the architecture process, and the use of architectural standards and transitional processes drive the output. The CIO council began developing the FEAF in 1998 with specific focus on creating synergies between US government departments as well as maximising the benefit of IT within government (Miller, 2004). "FEAF was built on the enterprise architecture model of the National Institute of Standards and Technology (NIST), which allows for organizing, planning, and building an integrated set of information and IT architectures." (Goethals, 2006:11).

The framework aimed to document and describe architectures of high priority areas that that shared common departments and spanned across organisational boundaries (Federal Architecture Working Group (FAWG), 2001). As mentioned previously, FEAF subscribes to a segmented architecture as opposed to a centralised one, allowing different government departments to embark on their separate EA initiatives within the ambit of the federal enterprise. This is valuable to other organisations using FEAF as well, since it allows different departments within the organisation to embark on EA initiatives at their own pace, within an overarching governance framework. The main components of the framework as well as a brief description of them is provided below (CIO Council, 1999):

- Architecture Drivers – refers to an external factor that causes a change in the architecture.
- Strategic Direction – ensures that all changes adhere to the overall strategy of the enterprise.
- Current Architecture – depicts the current state of the enterprise.
- Target Architecture – represent the future state of the organisation.
- Transitional Processes – refers to the processes to bridge the gap between the current architecture and target architecture in line with the strategy of the enterprise.
- Architectural Segments – refers to departments or divisions within the enterprise.
- Architectural Models – provides the motivation for managing change within the organisation.
- Standards – refers to the rules that must be followed within the framework with the focus on interoperability.

The above mentioned components form the foundation of FEAF and provide a view as to the types of artefacts that need to be documented within this framework.

2.2.1.3. The TOGAF Framework

The Open Group Architecture Framework (TOGAF) is owned by the Open Group and provides a methodology for the development of EA (The Open Group, 2010). TOGAF defines an iterative, cyclical process with eight steps, including a preliminary phase, with the view to define the enterprise (Lucke et al., 2010). TOGAF has emerged over the years as a popular framework for enterprises, with version 9 of the framework being the latest iteration. According to (Jablonka, 2009), most organisations have chosen TOGAF because the framework allows for architectures to be developed that are:

- Consistent
- Reflective of the needs of the organisation
- Inclusive of best practices.
- Less riskier in terms of the development process
- Able to demonstrate value in shorter timeframes.

In order to achieve the results highlighted above, TOGAF also places strong focus on governance, “ensuring a level of visibility and control that provides support for all stakeholder requirements and obligations (The Open Group, 2003:15).”

Figure 7 represents the TOGAF framework with specific reference to its process of implementing EA, namely the Architecture Development Method.

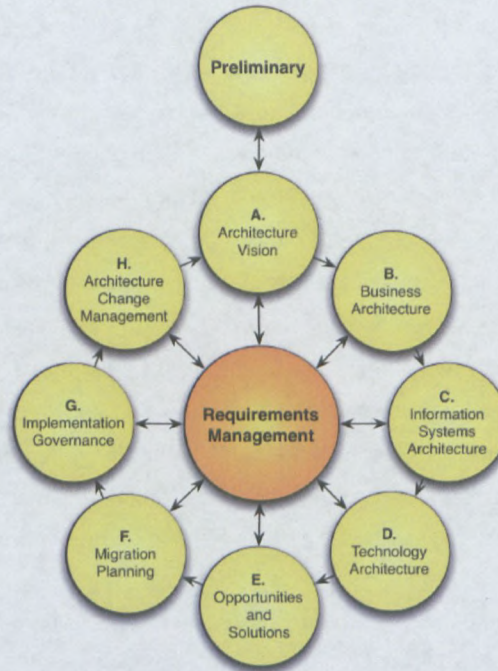


Figure 7: TOGAF Architecture Development Method (The Open Group, 2010)

Lankhorst (2005) describes Figure 7 as an architecture process made up of four phases: Idea, Design, Use and Management that take an idea or business problem through to the solution implementation. As shown in Figure 7, TOGAF highlights the key domains of EA namely, the business, information systems, and the technology architecture. The technology and information systems architectures are documented in the context of the business architecture, ensuring adherence to the business requirements as well as alignment to the business architecture, which is the ultimate aim of EA (The Open Group, 2003). These domains are then populated through the TOGAF Architecture Development Method (ADM), where the process reflects the current state architecture, the target architecture, and then finally the gaps between them.

Many EA teams agonize over the choice of EA frameworks. However, it is much more important to have a consistent organizing structure for architectural concepts irrespective of the framework (Lapkin & Weiss, 2008). TOGAF provides an approach for documenting the architecture artefacts in the context of each of the processes documented in the ADM. TOGAF consist of three main components namely (The Open Group, 2010):

- Architecture development Method – which is discussed above and depicted in Figure 7.
- Enterprise Continuum – which is a repository of all architecture artefacts.

- Resource Base – which contains a range of resources including guidelines and templates which can be used in conjunction with the ADM.

The key theme within TOGAF is delivering business value, and the above components assist in achieving that objective, by addressing the concerns of the relevant stakeholder's through the ADM, as well as ensuring that necessary input is received from the relevant stakeholders (The Open Group, 2003).

2.2.2. EA Framework benefits and Shortfalls

This section summarises some of the benefits and shortfalls with regards to the use of EA frameworks, in the context of the literature that was reviewed.

2.2.2.1. EA Framework Benefits

According to FAWG (2001) and the EADirections (2007), the following are some of the benefits of using an EA framework:

- EA Frameworks simplify the complexity of the data that is being represented.
- EA frameworks assist in the analysis of the entities, providing a view based on the audience.
- Frameworks help to organize the huge number of complex elements and relationships that make up an enterprise. Highlights all the areas to consider for the scope of your EA.
- EA Frameworks assist the architects in defining the scope of their projects.
- An EA framework allows an organisation to create a repository of artefacts in order to avoid duplication and re-work.
- An EA framework provides a means of ensuring a consistency check between the intent of the project and the outcomes that have been documented.
- The integration challenge facing organisations is out into context through an EA framework as all of the relationships between entities are displayed through the framework.

Schekkerman (2004), states that an EA Framework allows an organisation to represent their concerns according to different perspectives, as well as creating a holistic perspective of the organisational elements. As highlighted in section 2.2.1, EA frameworks provide a means of representing various aspects of the organisation, which allow different stakeholders to view the same content from different perspectives. The stakeholders are also able to see the relationships between other areas within the organisation as well.

EA frameworks also, through structuring of organisational elements in a logical manner, assist in modelling the business in a way that allows for effective business analysis (Ganesan & Paturi, 2008). The ability to effectively analyse the business from many different perspectives provides a means with which to drive many strategic objectives of organisations such as lowering total cost of ownership,

removal of duplicate functions and many more, which can be driven from the views that an EA framework is able to articulate. Manas and Utschig (2010), summarise the benefits of EA frameworks by stating that they provide a means of quickly identifying projects that need to be driven across the organisation, however they also caution that organisations should always ensure that they balance their investment in these frameworks with the output achieved so as to ensure that tangible benefits can be presented back to the sponsors.

2.2.2.2. EA Framework Shortfalls

The following are some of the shortfalls of EA frameworks according to (Schekkerman, 2004):

- Lack of holistic perspective in some EA Frameworks.
- Lack of overarching standards in terms of EA frameworks.
- No clear guidelines as to whether organizations should choose an existing EA framework or create their own.

According to (EADirections, 2007) the following are some of the shortfalls of using an EA framework:

- There is too much focus placed on the EA tools rather than the EA process and the outputs that must be generated. EA frameworks are sometimes misrepresented creating a misconception that a framework can do the thinking for an organisation.
- The business must drive the value and not the framework.
- EA frameworks seem to suggest that all components of the framework must be populated before any tangible value can be achieved.
- An EA Framework should not dictate but rather support the needs of an organisation.

Hirvonen (2007) highlights the following shortfalls in terms of EA frameworks:

- Too much complexity.
- Not enough balance between technology focus and business focus.
- Some Frameworks have too strong focus on systems development as opposed to planning.

Although EA frameworks, aim to address different perspectives of an organisation, continuous and occurring perspectives cannot be represented at the same time in one framework (Martin & Robertson, 2003). This creates the need for organisations to present these perspectives using other mechanisms, which can possibly defeat the purpose of an EA framework, due to the duplication of information, however as mentioned previously, the objective of the framework is to provide a guide to achieving an organisational objective, and duplication might be unavoidable in certain instances. "There has been little empirical research on the effectiveness of enterprise architecture frameworks, or by implication the software tools that are used to implement these frameworks for the purposes of managing technology for strategic organizational change." (Cane, 2007:441).

All of the authors referenced above provide views on both the benefits and shortfalls of EA, however there seems to be very little mentioned with regards to the practicality of the above statements. In my experience, most IT organisations have been criticised for the lack of practicality with regards to EA, and business seems to think that these ideas are only valid from a theoretical perspective, proliferating the misalignment between business and IT. Another criticism from an industry perspective is the fact that there is too much focus on the EA frameworks rather than the actual delivery of a solution to the business problem.

The above sections have provided an overview of some of the benefits as well as shortfalls of using EA Frameworks, however as highlighted by (Cane, 2007), there is still much more research that is needed with regards to EA frameworks in order to measure the effectiveness of EA frameworks, especially in terms of its ability to assist in the delivery of an EA.

2.3. Service Oriented Architecture (SOA)

Service Architecture, Service Oriented Architecture (SOA), Event Driven Architecture and many other architectural concepts are currently used in technology. Although the standard view is that Services are a technology solution to add agility, experience has proven that technology solutions rarely deliver agility except when they are focused on the business visions (Jones & Morris, 2005). As with any new area in IT, there are numerous definitions, some of which have been documented below:

- SOA is defined as a distributed architecture style for building systems based on loosely coupled components called services (Brown, Delbaere, Eeles, Johnston & Weaver, 2005).
- SOA is defined as services that are associated with business processes since they perceived as what customers pay for (Perrey & Lycett, 2003).
- SOA is defined as a style that results from the use of design principles, resulting in services that conform to certain characteristics (Sprott & Wilkes, 2004).

For the purpose of this thesis the definition below is supported, where the focus is on SOA that is a business tool, allowing business to architect their processes independent of each other, thus driving the other architectural domains to follow the same principal.

The definition provided is as follows: "Service Oriented Architecture (SOA) is a conceptual business architecture where business functionality, or application logic, is made available to SOA users, or consumers, as shared, reusable services on an IT network. Services in an SOA are modules of business or application functionality with exposed interfaces, and are invoked by messages" (Marks & Bell, 2006:1).

In order to fully understand the concept of SOA it is best to separate each of the terms that make up the concept, namely: Service and Architecture, the orientation term refers to designing architecture as a service. The objective of a service is to represent what the business does and place a boundary which all parties, but predominately the business can agree on. It is this representation of the business that the creation of a Service Architecture must be focused, technology is a secondary element (Jones & Morris, 2005). In essence, the above statement creates the foundation for the understanding of SOA – it is the aligning of the technology with the business processes and ensuring that these elements are constantly monitored so that the technology is always addressing the business functions.

The second part of the concept of SOA is the architecture, which is defined as: "Architecture is the structure of the system, comprised of components or building blocks, the external visible properties of those components, and the relationships among them." (Bass, Clements & Kazman, 2003:21). It can be deduced from the definition of the two terms, service and architecture, that SOA is the process of representing what the business does in the context of the structure of the systems, which are comprised of components or building blocks, the external visible properties of those components and the relationships between them.

The following properties were identified and must be prevalent for an architecture to be referred to as a SOA (Windley, 2004) ; (Bieber & Carpenter, 2002) ; & (Stevens, 2002):

- **Discoverable and Dynamic** – Services are discovered using a directory and are bound at execution.
- **Loosely Coupled** – SOAs are composed of multiple services connected in such a way as to be resilient in the face of network failures and latency.
- **Locationally Transparent** – SOAs are constructed in such a way that the overall system is unaware of, or at least ambivalent to the location of various services.
- **Diversely Owned** - SOAs may be composed of services that are owned and operated by outside organizations.
- **Interoperable** – Standards ensure that services from differing organizations can use each other's services.
- **Composable** – Applications in SOAs are created by composing pre-existing, well-tested services from multiple providers.
- **Network-addressable** – Networks are central to the idea of services that are discoverable and interoperable.
- **Self-healing** – When applications are created by composing dynamically discovered components that are owned by multiple organizations, the ability of the system to rediscover and bind to working services when services fail is critical.

Although these are technical characteristics, the key aspect is the underlying principles, whether we address SOA from a technology or from a business perspective these principles must be prevalent. In

order to explain this aspect more clearly, the principle of interoperability is used as an example. In the context of business, the business processes must be interoperable in order for organisations to do business with each other e.g. there needs to be a contract in place that determines the business rules. In the context of IT, the IT capabilities must also be interoperable in order to facilitate the business transaction e.g. one organisation might use SAP Financials and the other might use Oracle Financials – there needs to be standards in place for these systems to work together.

Figure 8 provides a high level overview of the SOA components and the relationships between them. Although these components are at a technical level they form the foundation of SOA, but they can only be implemented effectively once we have a defined business problem that drives this methodology.

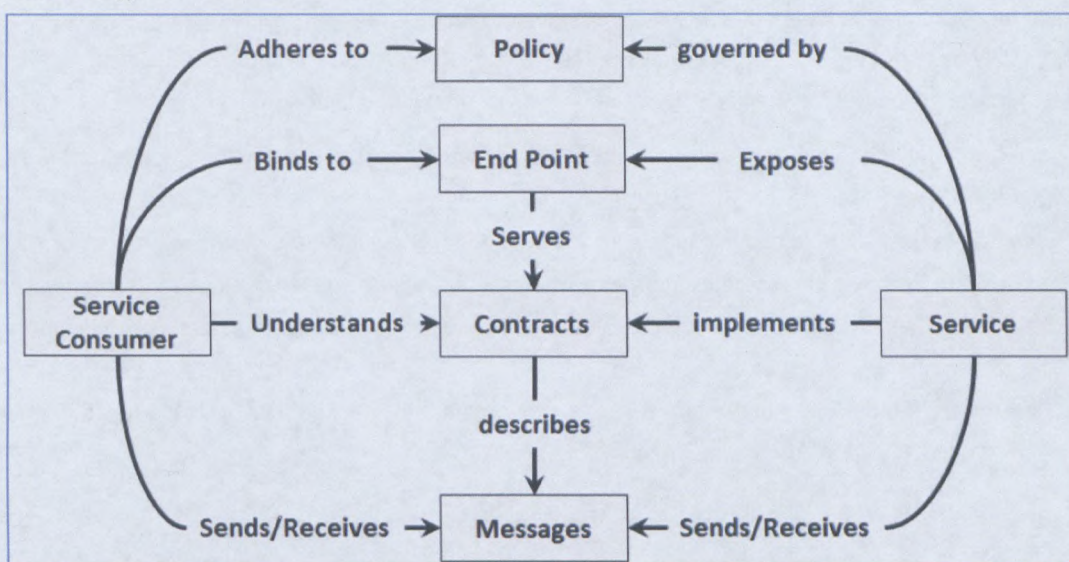


Figure 8: SOA Components and Relationships adapted from (Rotem-Gal-Oz, 2007)

Figure 8 depicts an example of the interaction between a service consumer and a service, outlining the contract between the two entities as well as some of the rules that govern the process of interaction. The purpose of Figure 8 is to represent some of the complexities associated with service oriented architecture, using a simplistic example. A business process can be made up of a number of services and if the relationships between services are not governed, the business process will fail, which could have major impacts on an organisation. Figure 8 defines the components that need to be available as well as how all the components will work together in order for the service to be consumed. There must be a policy, an endpoint, a service consumer, a contract, a service, as well as a messaging component all working together, according to the defined contract, in order for the services to be utilised.

2.3.1. The Business Reason for SOA

A Finnish American Architect famous for varying his architecture style based on the demand of the project, stated: " Always design a thing by considering it in its next larger context –

A chair in a room,
a room in a house,
a house in an environment and an
environment in a city plan." (Saarinen (quoted from Serraino, 2006:1)).

The process of SOA is based on the above design principle where each business process or function must be considered in its larger context so as to ensure that the design provides an organisation with the ability to operate efficiently and that the technology is able rapidly respond to business change irrespective of whether the change is initiated by internal or external factors.

A service architecture broadly follows a four step process, as depicted below (Jones & Morris, 2005:6):

- **What:** Defining the scope of services, is about determine what the services actually are.
- **Who:** Who are the external actors that drive the services or with which the services interact.
- **Why:** Identifying why one service talks to another, and why external actors interact with the services
- **How:** The detail about the processes that co-ordinate the services and also the detail on how a service itself will be implemented.

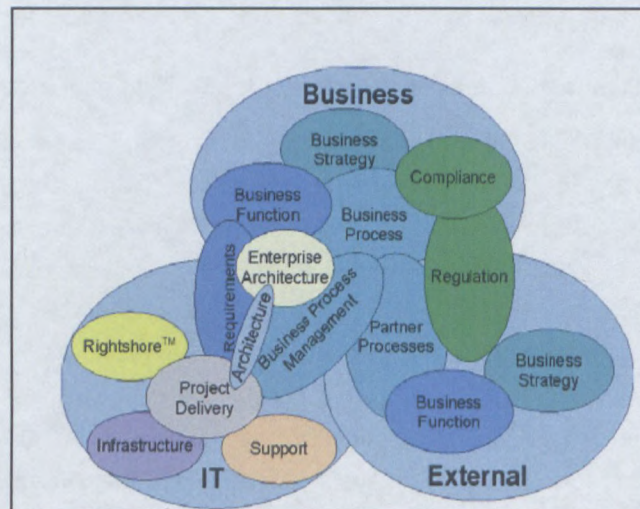


Figure 9: Standard View of IT and Business Interactions (Jones & Morris, 2005)

Figure 9 depicts the common interactions between IT and business and could become much more complex if the larger components were decomposed into smaller ones. The fundamental aspect in

Figure 9 is that it deals with the functions that are in use and not the domain under which they find themselves in order to highlight the fact that in order to obtain business and IT alignment, there are many functions that must be employed in collaboration with each other, and many times some functions might cross over the domains, for the benefit of solving the business problem at hand. The success of SOA is dependent on being able to answer the “What” aspects within an organisation. SOA projects that are technology focussed tend to concentrate on the “How” rather than determining the reason for embarking on an initiative. This approach has proven costly in many instances where SOA projects have not added any value to organisations simply because the business reasons behind an implementation are not taken into account (Linthicum, 2008).

Service Oriented Computing (SOC) is a research area that builds upon the understanding of SOA. Currently, SOA doesn't address overarching concerns such as management, service choreography and orchestration, service transaction management, coordination and other concerns that apply to all components in a services-based architecture. Such concerns are addressed by the Extended SOA or XSOA (Papazoglou, Traverso, Dustdar, Leymann & Kramer, 2006). This thesis does not delve into the concept of XSOA; however the aim is to point out the fact that this is an important trend in the development of SOA, with the focus on Service Orientated Computing.

Table 2 describes the components of SOC providing an overview of the current state as well as the challenges that are being faced within this field. SOA in relation to this field really focuses on the Service Design and Development aspect by providing a methodology for implementing SOC.

Table 2: Overview of the State of the Art and some Challenges in Service Research (Papazoglou et al., 2007)

	STATE OF THE ART	GRAND CHALLENGES
Service Foundations	Enterprise Services Bus : <ul style="list-style-type: none"> • Open Standards Based Message Back-bone • Implementation, Deployment, Management • Set of Infrastructure capabilities delivered by technology middleware • Implementation Back-bone for SOA (applications as services). 	<ul style="list-style-type: none"> • Dynamically re-configurable runtime architectures. • Dynamic Connectivity Capabilities. • Topic and Content Based Routing Capabilities. • Infrastructure support for application Integration. • Infrastructure support for data Integration. • Infrastructure support for process Integration. • Service Discovery
Service Composition	Orchestration: <ul style="list-style-type: none"> • Service Interaction at Message Level • Perspective and control at single end point. • Executable business processes. 	<ul style="list-style-type: none"> • Composability analysis operators for replaceability, compatibility, conformance. • Autonomic composition of Services. • QoS-aware service composition. • Business-driven automated composition. • Typing/syntactic conformance. • Behavioural Conformance. • Semantic Conformance.

Service Management	<ul style="list-style-type: none"> • Web service distributed management (WSDM). • Management Using Web Services (MUWS). • Management of Web Services (MOWS). 	<ul style="list-style-type: none"> • Self-Configuring Services. • Self-Healing Services. • Self-optimising Services. • Self Protecting Services.
Service Design & Development (Service Engineering)	<ul style="list-style-type: none"> • Port existing components using wrappers. • Component-based development, object oriented analysis and design. • Do not address key elements: services, composition, components realising services. • Only address part of the requirements. 	<ul style="list-style-type: none"> • Design principles for engineering service applications. • Associating a services design methodology with standard software development and business process modelling techniques. • Flexible Gap analysis techniques. • Service Governance.

Table 2 aims to highlight the aspects involved in SOC, and it has been used in this research to describe some of the underlying components with regards to SOA, in terms of things that need to be considered in the implementation of SOA. As mentioned previously SOC is a component of SOA which focuses more on the computing aspects, rather than the architecture aspects. However, the relationship between the two areas becomes more apparent in the Service Design and Development phase. Once the service has been architected using SOA, SOC uses this input to design and develop the service for actual implementation. Table 2 also highlights the aspects that need to be considered from a SOC standpoint after the service has been architected using SOA. There are a number of technical debates and discussions with regards to SOA and the intricacies involved in the provisioning of services and the integration of legacy systems into a SOA. This section aims to position SOA in the context of the business and to understand the business case for a SOA implementation. SOA should never be considered unless there is a business need for it that can be substantiated by a relevant business case (Baarda, 2008). A number of organisations embark on SOA initiatives without really understanding the business benefit of SOA, and thus Baarda (2008) highlights the fact that the investment needs to be justified through a means of a business case, which provides agreed measures of success and accountability after the implementation.

In order to justify an investment in service-orientation, we need to address the following issues (Homann, 2006):

- How do we prevent service-orientation from following previous architecture methods that have failed?
- How do we ensure that alignment to the business architecture?
- How do we maximize the life expectancy of the implementation in the context of a continuously changing environment?

The above questions need to continually be asked and answered prior to the commencement of any SOA Project. SOA implementations that have a technology focus prove difficult to motivate from a business perspective, as the correlation back to business needs does not exist. As highlighted by Baarda (2008), the business case serves as a means to justify an investment by the business, for a specific business need, and if this need is not met by the technology solution proposed then there is little value for the business. SOA implementations that have a technology focus without a business need are difficult to motivate to the business, as they do not understand what business requirement is being fulfilled.

A SOA can be categorised within the following business perspectives (Homann, 2006) namely business capabilities, capability connectors, business processes, business capability mapping :

- A **business capability** is a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome.
- Capability **connectors** represent the links that exist between business capabilities.
- **Business processes** describe how the business performs, or implements, the given capability, or how capabilities connect to deliver a desired outcome.
- **Business capability mapping** is the definition and clear structural outline of the capabilities and their connections that drive the activities of a typical company.
- **Business capabilities** are the building blocks of the business architecture, so thinking of capabilities as an architectural blueprint is a good analogy, whereas the process is the implementation of that architecture at any given time.

The above definitions focus on what the business does as part of its daily operations and the underlying thinking behind this approach is that we can apply a SOA to these definitions and subsequently build the other architectural domains in direct relation to the business functions. In many organisations their core business is not IT, and thus employing a technology based SOA to such an organisation cannot be easily motivated. Even in IT organisations their core business processes such as Finance and HR are not related to IT and thus a technology focused SOA will be difficult to support. SOA needs to focus on the core business of an organisation (Where does it earn its revenue?) and then employ technology, if needed, to enable the architecture.

A fundamental component of a SOA implementation is the business case justification. SOA is an approach, not a solution. SOA is a set of principles that applies to the construction of a solution, not the solution itself (Bradley, Schulte, Sholler & Malinverno, 2008). It is difficult to write a business case for SOA, simply because it is very difficult to justify the huge capital investment for an initiative without actually delivering anything tangible (Bradley et al., 2008). The dilemma is very similar to organisations attempting to write business cases for Enterprise Architecture; unless the business can see the tangible value and return on investment, approval of the business case poses a challenge.

The SOA business case needs to be documented based on business need and the ability to satisfy that need through SOA. Many companies even refrain from the word SOA because of the immediate connotation that it brings with it namely huge costs! Mannes (2009:1) in her blog, titled: "SOA is dead, long live Services", stated the following: "It's time to accept reality. SOA fatigue has turned into SOA disillusionment. Business people no longer believe that SOA will deliver spectacular benefits. "SOA" has become a bad word. It must be removed from our vocabulary."

Architects all around the world did not support the above statement (Mannes, 2009). There are however some validity in her arguments. The reference was being made to the word SOA and not what the concept represents. The concept of service orientated architecture is still very alive and well, however organisations are being cautioned on calling their initiatives SOA initiatives or even having the term in the title of their projects, as this immediately creates preconceived ideas of escalating costs and little value as well as an idea that the initiative is an IT initiative.

Bradley et al., (2008); (Baarda, 2008); and (Strada, Lasagni & Habermann, 2008) recommend the following approach to delivering a SOA business case. The inputs are summarised below:

- Construct business cases for specific SOA-based projects, not SOA in general.
- Determine the appropriate SOA characteristics that contribute to technology and business benefits.
- Trace SOA principles to ultimate business value.
- Capitalize on existing business goals and success metrics.

2.3.2. SOA Benefits and Shortfalls

Malinverno (2008) advises that the application of SOA in the field of software development is estimated to reduce total IT expenses over the long term by as much as 20% compared to traditional development methods and the savings becomes exponential over time as library of business services expands and greater degree of reuse is achieved. However, looking only at the cost savings misses opportunities for the dramatic business process improvement SOA can deliver (Roch, 2006). The promise of real value has always been a contentious subject in the context of SOA; however there are many organisations that have seen value when using an SOA approach to delivering projects. Table 3 outlines Gartner's SOA benefits in relation to business and IT areas:

Table 3: SOA Benefit mapped to Business and IT Benefits(Malinverno, 2008)

SOA Benefit	Mainly an IT or Business Benefit	Overlaps With	Generally a consequence Of	Typically Kicks in	At What stage of SOA Maturity is best to start aiming at?
Improved execution of business processes	Business	Quicker time to market	<Intentionally left blank>	After the end of the first SOA project aimed at it; use this for pilots	All; especially introduction
Quicker time to market and shorter project cycles	Business and IT	Improved execution of business processes	Improved execution of business processes	Whenever a good base of reusable services is maturing	Spreading, but especially exploitation
Enablement of new business models	Business	Better alignment between business and IT	Quicker time to market and shorter project cycles	After a few successful, well governed, well measured SOA projects	Spreading and exploitation
Shift in IT culture from new developments to reuse	IT	Lowering total cost of application development and maintenance	All the previous benefits	Whenever a good base of reusable services is mature, and appropriate developer incentives are in place	Exploitation
Lowering total cost of application development and maintenance	Business and IT	All the previous benefits	Shorter project cycles	Two to three years after the start of an SOA journey	Exploitation and plateau

Table 3 highlights the key benefits from a SOA perspective and how these benefits relate back to business and IT, in terms of objectives as well as when organisations should expect to realise these benefits in terms of their SOA maturity. Table 3 also highlights the important aspect of maturity which plays a vital role in determining the success of SOA projects, as well as the setting the direction for a SOA projects, by allowing organisations to understand upfront which benefits they are likely to realise, as opposed to creating elevated expectations that are not aligned to the maturity of the organisation, Christopher Kistasamy
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causing misalignment between expectations and the final deliverables. SOA proposes a number of benefits both from a technology as well as from a business perspective. The key benefits are summarised in the Table 4:

Table 4: SOA Technology and Business benefits (Roch, 2006; Baarda, 2008; Strada et al., 2008 & OASIS,)

SOA TECHNOLOGY BENEFITS	SOA BUSINESS BENEFITS
<ul style="list-style-type: none"> • Flexible Architecture • Easier integration • Supports business process management • Facilitates enterprise collaboration initiatives • Speeds custom application development 	<ul style="list-style-type: none"> • More effective integration with business partners • Support customer service initiatives • Enable self service • Streamline the supply chain • More effective use of external service providers • Facilitate global sourcing

Table 4 highlights the benefits of SOA in assisting organisations to achieve their objectives whether they are technology focused, such as driving down the cost of IT through easier integration, or whether they are business focused such as streamlining the organisational supply chain. The aim of Table 4 is to highlight the tangible benefits that organisations can achieve through the use of SOA.

Although the use of SOA can provides a number of benefits, there are also a number of challenges that must be overcome in order to realise the benefits mentioned in Table 4. The challenges that organisations can face in terms of the implementation of SOA are outlined in Table 5. An implementation of SOA requires a change the mindset of all involved, due to the fact that SOA focuses on providing services in an efficient and automated fashion that is usually underpinned by a service contract to ensure accountability for both the quality of the service as well as the efficiency of the service. Table 5 highlights the challenges that SOA poses from a technology, people and process level, as it brings about new ways of automating services at all levels, however by understanding these potential challenges prior to the commencement of a SOA initiative, organisations can ensure that proper planning and corrective measure can be implemented to reduce the impact of the challenges reflected in Table 5.

Table 5: SOA Challenges (Roch, 2006; MacVittie, 2007 & Wu, 2007)

SOA CHALLENGES

- Early adoption and evolution of supporting technology.
- Organization change is necessary since SOA crosses system boundaries.
- The architecture is enterprise in scope encompassing dispersed and heterogeneous systems.
- The infrastructure is distributed requiring high availability and scalability.
- The project life cycle methodology requires changes due to complex system dependencies, SOA specific design patterns, and the change impact to the infrastructure and users.
- Program management is often complex due the project scope, interdependencies and new technology risks.
- Quality Assurance is difficult since services are distributed, have many interfaces, require new testing environments, and message based testing tools.
- New competencies must be developed spanning project management, analysis and design, development and operations.
- Needs to be supported by EA.
- Identification of what services to provide and where to find them.

A SOA implementation needs to have strong business support as the services that are implemented will be based on business processes or functions, and the governance model around these services will need to be driven by the business as well to ensure that some of the challenges highlighted by Table 5 can be avoided.

Figure 10 provides a view of the forces that drive SOA, and these aspects are typically documented in the SOA business case as well, e.g. legislation might dictate to an organisation that certain requirements need to be fulfilled, and time constraints might necessitate a SOA approach. As highlighted by Figure 10, there are a number of forces that drive SOA both internally e.g. business requirements or design goals, as well as externally e.g. competition or regulation, with both providing different contexts as well as different business cases for the use of SOA.

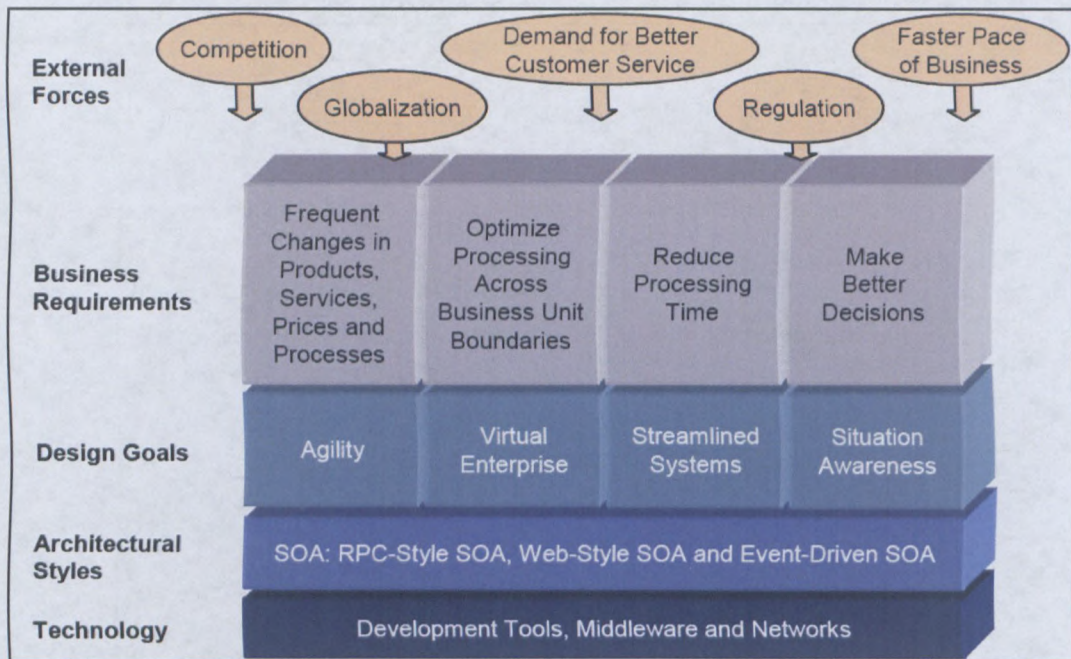


Figure 10: Some of the External Forces that drive the use of SOA (Schulte, 2008)

Figure 10 depicts the driving factors for the implementation of SOA; however the greatest benefits of following an SOA approach are the design goals that SOA employs namely (Schulte, 2008; Strada et al., 2008; and Roch, 2006):

- **Agility:** Business strategies have become intertwined with IT strategies, and most changes to a business process, product or service require changes in the application systems that support it. This means that IT systems have to be agile so that the business can be agile.
- **Virtual enterprise:** As enterprises and their suppliers and distributors become increasingly connected, semi-autonomous business units need to work together more effectively. This often means that the respective application systems must interoperate directly with one another.
- **Streamlined systems:** Companies need to provide better customer service, reduce the time that resources sit idle and improve their overall operational efficiency. In many situations, this involves reducing the elapsed time of end-to-end business processes.
- **Situation awareness:** Organizations want to sense changes in the business environment better and respond more quickly. Situation awareness means knowing what is going on so that you can decide what to do.

The above benefits are some of the key aspects of the business case for SOA where tangible return on investment can be measured.

2.4. The Relationship between SOA and EA

EA and SOA seem to be two separate worlds (Linthicum, 2007). A lack of understanding of the relationship between SOA and EA has led to few organisations reaping the combined benefit. SOA and EA practitioners have also added the extra element of rivalry between disciplines, suggesting that one discipline is more important than the other (Harding, 2007). The rivalry has created very little synergy between EA and SOA efforts, causing the organisations to suffer the consequences either of having projects delivered late or having to come in over project budget especially in EA or SOA implementations (Noran, Bernus & Meersman, 2008). Some traditional enterprise architects have not done a stellar job in understanding the opportunities within SOA and the SOA practitioners have not completely understood how SOA integrates with existing enterprise architecture standards, notions, and practices (Linthicum, 2007).

EA supplies answers that encompass organization-wide processes, how they are aligned with corporate strategies and how processes are linked to performance measures whereas SOA offers customer-responsive IT solutions and inter-functional coordination of information flows and a robust platform upon which the business can apply their applications (Rohan, 2008). EA and SOA can co-exist based on Rohan's definition, where both are equally significant in ensuring the technology solutions provided are supportive of the business processes. It is possible to argue that both have a clear role to play in achieving business and IT alignment thus alleviating any confusion; however this is not easily done due to the similarities between the two methodologies.

Figure 11 provides a high level view of the different forces that impact the way in which enterprises are architected. The purpose of Figure 11 is to highlight the constant factors that cause an EA to change, and more importantly to highlight that EA is never a constant, but continuously changes based on both internal and external factors. The business drivers need to be clear and well understood when embarking on an EA implementation, so as to ensure that that architecture is not built for every scenario as depicted below, but rather that the EA focuses on relevant scenarios that aim to address the business needs (Malinverno, 2008).

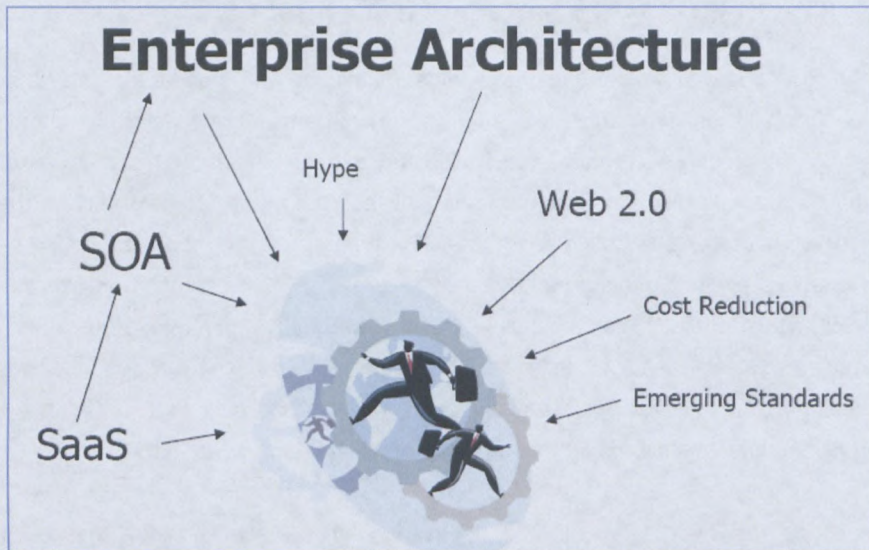


Figure 11: Forces related to Enterprise Architecture (Linthicum, 2007)

In order to understand SOA, it is important to understand the principle on which this methodology is built, namely Service Orientation (SO). Service Orientation is the architectural style that supports loosely coupled services to enable business flexibility in an interoperable, technology-agnostic manner (Schekkerman, 2006b). SO can be applied to various areas. However, it is simply a design style and depending on the implementer there will be a number of different ways to develop a solution to any particular problem. For example, to software developers SO will relate to how programming constructs are utilised in the definition of web services. However, to business people, SO would relate to business strategies that leverage reuse such as the implementation of a common tax standard across a business. In the event that business were to change the tax standard within the organisation from the Generally Accepted Accounting Practice (GAAP) to the International Financial Recording System (IFRS), SO would be a means to achieve this due to the fact that business would not need to change every GAAP practice everywhere in the organisation, they could rather change it once centrally and let all other business areas subscribe to the new standard.

Table 6 maps out the elements of the SOA solutions stack to their corresponding domains within the EA Framework. This is key to the understanding of the relationship between EA and SOA as it contextualises the terminology as well as the practices that are involved in both EA and SOA, however the key question then becomes if one can exist without the other.

Table 6: Mapping SOA and EA Domains (Ibrahim & Long, 2007a)

Architecture Domains	SOA Solutions Stack	EA Framework Domains
Business	Business Process	Business Architecture
Applications	Services and Components	Application Architecture
Integration and Middleware	Integrations Architecture / ESB	Technology Architecture
Data	Data Architecture	Information Architecture
Operations	QoS, Security, Monitoring, and Infrastructure	Technology Architecture

Table 6 maps out the relationship between SOA and EA at a very high level, highlighting the underlying relationship between business and IT, and the various integration points, throughout the architecture domains. SOA facilitates the development of business architecture by using the outcome of business processes and other business architecture artefacts, such as Component Business Modelling (CBM), as input to identify business services. In section 2.3 the definition of SOA was provided, highlighting the fact that SOA is a conceptual business architecture. Table 6 highlights the relationship between the architecture domains, SOA solutions stack, and the EA framework domains which is in line with the definition provided for SOA in section 2.3. The business process in the SOA paradigm relates to the business architecture in the EA framework paradigm. In contrast, EA is concerned with the development of business architecture, including business processes and CBM among others (Ibrahim & Long, 2007a). EA and SOA are complementary, with each dealing differently with the domains of EA. Table 7 highlights both the similarities as well as the differences between SOA and EA.

Table 7: Similarities and Differences between EA and SOA (Ibrahim & Long, 2007b; Alwadain, Korthaus, Felt & Rosemann, 2010 & Olamendy, 2011)

Similarities	Differences
<ul style="list-style-type: none"> • EA and SOA address similar architectural domains • EA and SOA have strong focus on Business / IT alignment • EA and SOA are driven by Business objectives • EA and SOA require similar strategies and planning activities. 	<ul style="list-style-type: none"> • EA focuses on defining business components, while SOA focuses on business services. • EA deals with application frameworks and enterprise applications, while SOA's scope is on service modelling. • EA deals with enterprise-level infrastructure, while SOA focuses on the infrastructure that supports services. • EA addresses enterprise integration

	patterns and when they should be used. SOA provides an integration approach based on using services.
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Advances in integration technology, intelligent and flexible middleware as well as web services, are providing new ways for designing more responsive enterprise architectures resulting in the building of new business capabilities faster, cheaper and in a vocabulary the business understands (Banerjee & Aziz, 2007). There are natural synergies that exist between SOA and EA, and most EA projects utilise some form of SOA as it provides a method with which to align technology or applications with the business architecture. Table 8 provides a project view of how these two concepts should complement each other; however the same principles can also be used programmes as well as strategies in terms of aligning SOA and EA.

Table 8: Some Shared Actions in SOA and EA projects (Linthicum, 2007)

What should SOA do for EA projects?	What should EA do for SOA projects?
<ul style="list-style-type: none"> • Create and populate EA repository with appropriate documentation. • Comply with existing EA standards, when possible. • Demonstrate need for new standards or extensions to EA. • Provide an opportunity for SOA Proof-of-Concept (POC). • Contribute to the ongoing evolution of EA standards, patterns and models. • Seek service reuse opportunities • Bind services with appropriate partners • Create long term service development, deployment, and management plan • Link back to proper EA methods 	<ul style="list-style-type: none"> • Standardization. • Drive towards common semantics between EA and SOA. • Be proactive in identifying services that should be built and identifying the development efforts that are positioned to deliver needed services. • Broader than the project view. • Research and recommend SOA technology choices, approaches and designs. • Collaborate on technology choices, approaches and designs that can satisfy a broader part of the enterprise. • Extend the application of successful SOA implementations to other parts of the enterprise. • Governance integration. • Culture Change.

SOA and EA provide guidelines to ensure that an organisation's business practices are fully supported by its investment in IT. There are however some potential problems that may arise if this relationship between SOA and EA is not agreed to at the outset of implementing an EA (Ibrahim & Long, 2007b):

- Potential overlap between the responsibilities of the SOA lead and the enterprise architect. This overlap in responsibilities may cause confusion and friction between the two leads that ultimately might impede the success of both SOA and EA.
- Competition between SOA and EA for the same business resources. In most enterprises, the time and availability of business subject matter experts are scarce resources. As such, asking them to participate in duplicate and similar activities and governance organizations for both SOA and EA can cause lack of participation and perception of inefficiencies. This can lead to less contribution by these experts to the activities of one or both.
- Potential for making contradicting architectural decisions that affect the whole enterprise. With both efforts for SOA and EA progressing in isolation, it's likely that some of the decisions made by one or the other could cause further confusion among those who are relying on the outcome to guide their decisions.

Figure 12 provides a view of a model for how SOA can enable EA, based on the work of (Linthicum, 2007). The key elements from this model are the inputs from a business perspective as well as the inputs from an IT perspective, where the business strategy together with the executive management team drives the implementation. Another key aspect is whatever model an organisation chooses to use; there must always be a link back to the business. The final aspect from the model is the overarching role of governance within the process to ensure adherence to the plans initiated by the organisation.

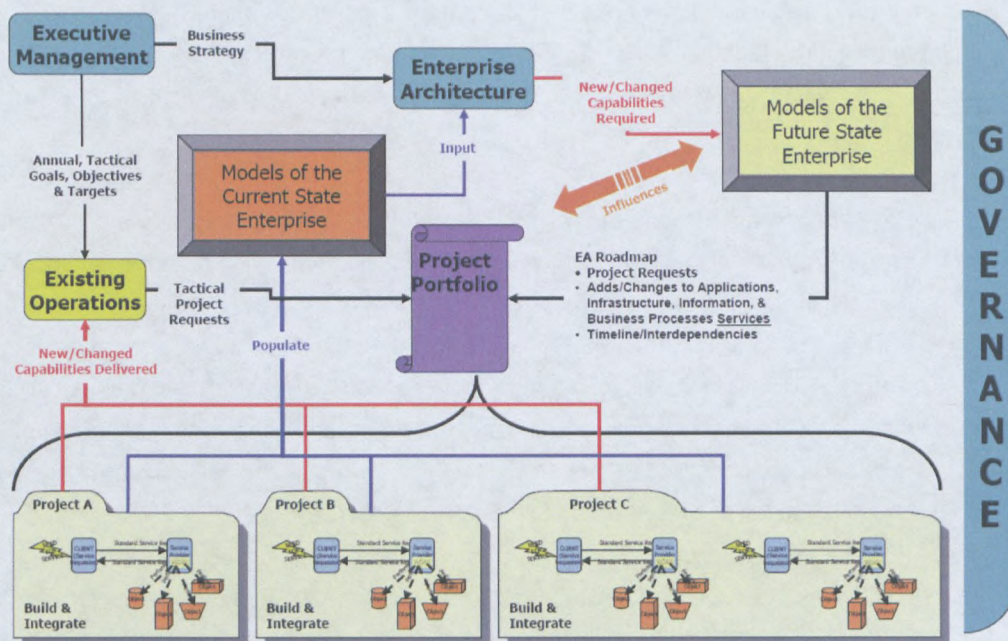


Figure 12: Integrated SOA and EA (Linthicum, 2007)

Figure 12 depicts the inputs and outputs when integrating EA and SOA. There is a drive from executive management based on their vision which has a direct impact on existing operations, as it is in this area that new or changed capabilities will be introduced. The EA has a direct relationship with the business strategy from an input perspective as well as executive management from an ownership perspective, highlighting the business impact on the relationship between SOA and EA. The SOA projects that have been initiated in Figure 12 can be directly linked back to the business strategy and EA, thus highlight the link between SOA and EA, and the potential business benefit that can be achieved by governing the relationship of SOA and EA, especially from an investment perspective, due to the fact that implementation projects can be related back to business strategy.

2.5. Guidelines to Consider in using a SOA approach in EA

I analysed all of the literature as documented in Chapter 2. The analysis was done through the summarising of the different topics that were related to the thesis. I categorised the topics into mini literature reviews where I wrote a review for each topic identified. Although there were a number of reviews that were written, not all of the literature was used. However, based on the context of the research problem, the relevant data collected was summarised and thereafter through the process of analysis of the data collected and the linking of common themes. The themes that were used as a basis for the guidelines are documented below:

- EA and Business Strategy,
- SOA and Business Strategy,
- Alignment of business and IT,

- Relationship between SOA and EA,
- Guidelines for SOA to enable EA

Based on the above themes, the following guidelines were extracted for using a SOA approach in the implementation of EA:

- Define what architecture artefacts SOA will deliver as well as those that EA will deliver, to avoid duplication and ensure that these two disciplines complement each other. That the links back to business are clearly articulated (Ibrahim & Long, 2007b; Schekkerman, 2006b; and Rohan, 2008).
- Defines roles and responsibilities needed for both SOA roles and EA roles, so as to ensure that both teams are working towards the same objectives especially with regards to linking business and IT (Ibrahim & Long, 2007a ; Ibrahim & Long, 2007b; and Linthicum, 2007).
- Define what SOA and EA are specific to the organisation as well as what each will deliver to the organisation. This should be enshrined as a group wide business and IT principle against which SOA and EA endeavours are measured (Ibrahim & Long, 2007a; Ibrahim & Long, 2007b; and Linthicum, 2007).

The objectives of EA and SOA are similar, however EA is a framework that covers all dimensions of IT architecture for the enterprise, while SOA provides an architectural strategy that uses the concept of “Service” as the underlining business-IT alignment entity (Banerjee & Aziz, 2007). Appendix D provides all of the mini literature reviews that were done in order to summarise the data as well as link the common themes.

2.6. Summary

This chapter provided a high level discussion of the relationship between SOA and EA indicating the close relationship between the two concepts. A background to the chapter was initially provided highlighting the research questions as well as the sub-questions in order to provide context for the literature review. An overview of EA and SOA was then provided, in order to provide a literature perspective in terms of the key concepts within this research. The relationship between SOA and EA was then investigated, highlighting that these two concepts should not be dealt with in isolation to each other especially when dealing with enterprise wide projects. In the context of EA, which is enterprise wide, SOA cannot be dealt with in isolation. However in smaller projects or initiatives that do not affect the entire organisation, but whose aim is flexibility and agility, a SOA approach can be utilised to deliver the solution but there should always be a clearly defined link back to the business. The research question was then answered by providing guidelines that were derived from the Christopher Kistasamy 209239409

literature as to how SOA can be used as an enabler for EA. Finally, the chapter is then concluded with a summary section, summarising the outcomes of this chapter.

3. Research Methodology and Design

3.1. Introduction

In this chapter the research approach used as a guideline in conducting this study, is presented. Some of the concepts and techniques associated with embarking on a qualitative study are discussed as well as specific aspects that were related to this particular study. The chapter also covers the research design as well as the data collection techniques used to present the information. The chapter concludes with a summary section that allows the reader to reflect on the information presented.

The research philosophy for this research was interpretive with the aim of recommending guidelines for using SOA with EA. Orlikowski and Baroudi (1991:5) state that "Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them." In this research the aim was to identify guidelines in using SOA as an enabler for EA. These guidelines were derived from theory and also from interviews of domain experts. In an interpretive study the researcher acknowledge the different views of interviewees.

The research approach used in this study was a qualitative inductive approach where the guidelines were derived from the literature and a single case study. Maxwell and Kaplan (2005) provide support for this approach stating that qualitative research methods are primarily inductive where theories are developed during the study so as to take into account what is being learned about the setting and the people in it. Some aspects, for example, SOA and EA that are discussed in this thesis are relatively new and thus the research approach also required an exploratory analysis of the data with the aim of finding the most appropriate guidelines in order for SOA to enable EA.

The research strategy was a combination of a single case study as well as the interpretation of the questionnaires and literature. According to Yin (2009), a single case design is justifiable under the following circumstances; a critical test of existing theory, a rare or unique circumstance, revelatory or longitudinal purpose. The main aim of this research was to provide a set of guidelines for the implementation of SOA in the context of EA, and thus the case study approach was appropriate to identify the guidelines.

For the purpose of this research, the number of cases was limited to one, and this together with the secondary data provided sufficient information to substantiate the output. It is appropriate to do a single case study when the researcher wants to do an in-depth analysis (Yin, 2009) as was the case

in this particular project. In order to generalize the findings this research should be conducted in more case study environments, however it was beyond the scope of this research project.

Apart from the above, one final lens was also used in combination with those already mentioned to reflect on the data, namely that of industry experience, where the author reflected on the data collected to build a practical set of guidelines in order to ensure sustainability outside the academic body of knowledge. The structure of the chapter is depicted graphically in Figure 13.

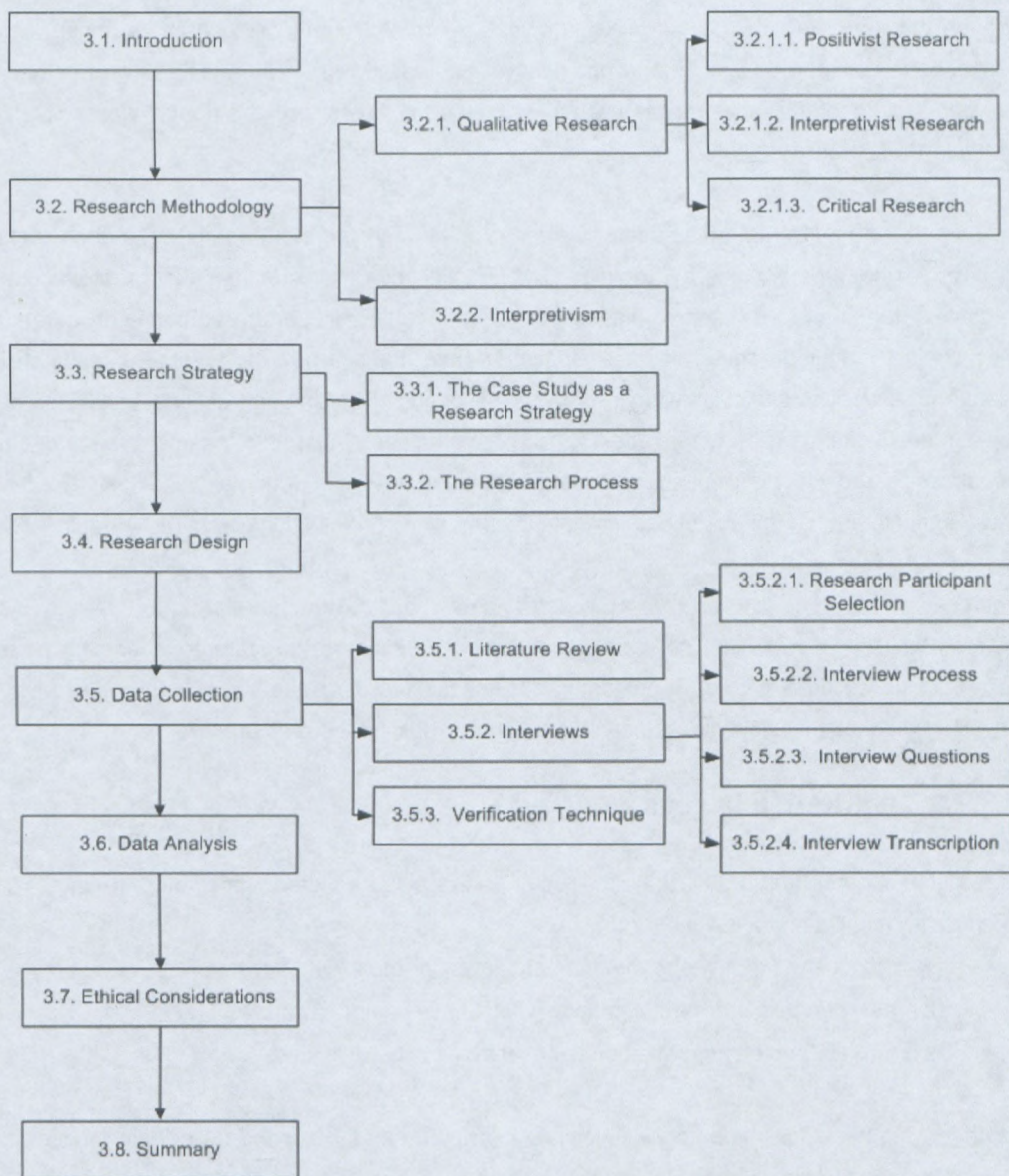


Figure 13: Graphical representation of Chapter 3

3.2. Research Methodology

In any research endeavour, the research methodology is one of the most fundamental elements in guiding the researcher through the process; however it is the philosophical assumptions that the researcher makes that truly determine the chosen methodology. According to Evered and Louis (1981), the assumptions that are being referred to above relate to whether the researcher has an

inward perspective or an outward perspective, which is determined by the researchers involvement both from an experiential perspective as well as his or her involvement within the context of the study. Although there are various ways in which to classify research methods, one of the most common distinctions is between qualitative and quantitative methods (Myers, 1997). The inward perspective more often refers to qualitative research whereas the outward perspective is normally associated with quantitative research.

Strauss and Corbin (1990), define qualitative research as any type of research that produces results that have not been determined by any means of quantification for example statistical procedures. In this context, the aim of the research was to gather an understanding and enlightenment with regards to the subject matter. Kaplan and Maxwell (2005) state that the goal of qualitative research is to understand issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context within which they act. In terms of quantitative research, the outcome is to provide results that are quantifiable, and the researcher aims to test hypothetical generalisations through the use of experimental methods and quantitative measures (Hoepfl, 1997).

In the case of this study, a qualitative approach was used due to the nature of both SOA and EA that requires practitioners to customise their approaches depending on their interpretation of a problem. The remaining sections provide more detail on the qualitative research methodology used in this study as well as the philosophical stance of the author in guiding the research.

3.2.1. Qualitative Research

Strauss and Corbin (1990), classify the use of qualitative research according to three broad categories as highlighted below:

- Used to understand any phenomenon about which little is yet known.
- Gain new perspectives on things about which much is already known.
- Gain more in-depth information on things that might be difficult to convey quantitatively.

The underlying basis for this particular thesis is highlighted by the second bullet point above. In the literature there are many references to both SOA and EA. In this research the aim was to provide a different perspective in terms of how EA and SOA relate to each other. Although much has been documented about these concepts, there is still a lack of consensus in industry as to the most appropriate ways to apply these concepts and therefore this research aims to provide some recommendations with regards to creating a common understanding.

According to Orlikowski and Baroudi (1991), qualitative research can be divided into three research epistemologies, namely: positivist, interpretivist, and critical research.

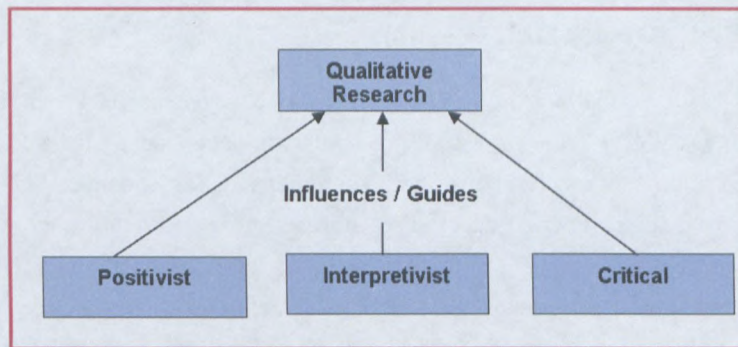


Figure 14: Research Epistemologies in Qualitative Research (Myers, 1997)

Figure 14 graphically depicts the three major research paradigms, as was done by Myers in 1997, which influence or guide a qualitative research study. The following section provides a brief discussion of the three stances as well as a clarification of the research philosophy for this research.

3.2.1.1. Positivist Research

Orlikowski and Baroudi (1991) state that research can be classified as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from the sample to a stated population.

Myers (1997) contribution suggests that researchers within the positivist context assume that reality is objectively given and can be described by measurable properties that are independent of the researcher or his or her instruments. Positivist studies attempt to bring a degree of predictability or certainty to a particular phenomenon by testing the theories associated with them in different contexts. (Lin, 1998), agrees with Meyers in that positivist research seeks to identify qualitative data that can be tested or identified in other cases

3.2.1.2. Interpretivist Research

Interpretive researchers start with the assumption that access to reality is only through social constructions such as language, consciousness and shared meanings (Myers, 1997). Interpretivist research seeks to combine qualitative data into systems of belief whose manifestations are specific to a case (Lin, 1998). Interpretive research aims to understand phenomena subjectively (Johari, 2009).

The underlying research paradigm for this research is an interpretivist approach, where focus was on the understanding of the phenomena of both SOA and EA within the context of a case study, as well as previously documented material, and finally personal reflection.

3.2.1.3. Critical Research

Critical research assumes that social reality is historically constituted and that it is produced and reproduced by people (Myers, 1997). Critical research is underpinned by the social, cultural, and political influences that need to be understood in order to accomplish such research (Klein & Myers, 1999). This type of research is seen as the hero of modern day society in that the nature of the research involves exposing discrimination in all forms and seeks to transform society where possible (Harvey, 1990). Orlikowski and Baroudi (1991), distinguish the critical paradigm from all others due to its evaluative dimension, in the sense that critical studies critique existing social systems and reveal any contradictions and conflicts that may be inherited.

3.2.2. Intrepretivism

Interpretivist studies aim to provide the researcher with the context of the problem being researched as well as the role that the aspect of context plays within the process of that particular research (Walsham, 1993). "Intrepretivism is seen as deriving from Ancient Greek times from the works of the sophists (anti-positivists), a school of thought based on logic and rhetoric." (Bolan & Mende, 2004:2). The interpretivist research paradigm is very subjective in nature as opposed to other paradigms mainly due to the fact the information that is being researched is interpreted by the researcher based on his or her philosophical stance as well as the relationship with the subject matter.

Orlikowski and Baroudi (1991:5) state that the criteria for classifying research as interpretivist is greatly dependant on the researcher having a non-deterministic perspective:

- "where the intent of the research was to increase understanding of the phenomenon within cultural and contextual situations";
- "where the phenomenon of interest was examined in its natural setting and from the perspective of the participants";
- "where researchers did not impose their outsiders' a priori understanding of the situation."

Myers (1997) highlights the importance of not automatically associating qualitative research with an interpretivist paradigm, which is often the case in qualitative research. The choice of research epistemology needs to be guided by the researchers underlying philosophical assumptions, and this process must occur through the natural progression of the research as the researcher becomes more familiar with his or her context. Table 9 highlights the characteristics of qualitative research as outlined by (Hoepfl, 1997).

Table 9: Characteristics of Qualitative Research (Hoepfl, 1997)
Description of Characteristics for Qualitative Research

I. Qualitative research uses the natural setting as the source of data.

II.	The researcher acts as the “human instrument” of data collection.
III.	Qualitative researchers primarily use inductive data analysis.
IV.	Qualitative research papers are descriptive, incorporating expressive language.
V.	Qualitative research has an interpretive character, aimed at discovering the meaning events have for the individuals who experience them and the interpretations of those meanings by the researcher.
VI.	Qualitative researchers pay attention to the idiosyncratic as well as the pervasive, seeking the uniqueness of each case.
VII.	Qualitative research has an emergent (as opposed to predetermined) design, and researchers focus on this emerging process as well as the outcomes or product of the research.

Table 9 provides a holistic view of the characteristics of qualitative research and these characteristics were a checklist for the researcher in order to categorise the research in a qualitative paradigm. In this research there existed a parallel to all the characteristics mentioned in Table 9, and this particular chapter delved into the detail within the different sections. A summary of the relationship between the characteristics and this research is highlighted below:

- Characteristic I: The source of data for this research was literature, and a single case study all of which were focused on the relationship between SOA and EA.
- Characteristic II: All of the data collection was conducted by the researcher.
- Characteristic III: The research approach was a qualitative inductive approach.
- Characteristic IV: The nature of this research, in which phenomena was being researched, required a descriptive writing style, which was demonstrated in this thesis.
- Characteristic V: I collated and interpreted all of the interviews, comments, and meaning as well as secondary information, which was documented in the Chapter 4 and Chapter 5.
- Characteristic VI: As mentioned in previous sections, there are many EA frameworks as well as SOA approaches, which are customised based on organisational requirements creating a unique situation with each implementation. In the case of this research, the organisation that was studied was also unique given the fact was it was a very well established business that had attempted various iterations of SOA and EA, and was still exploring the concepts.
- Characteristic VII: The focus of this research was on the relationship between SOA and EA and although these are not new concepts, the relationship between them is still considered as an emergent theme.

The above discussion of Hoepfl's characteristics within the context of this research highlights the qualitative nature of this research and the choice of methodology used.

One final aspect with regards to the research methodology as highlighted in the Introduction was the fact that this study followed a qualitative inductive approach to gathering and documenting the Christopher Kistasamy
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information. Qualitative induction refers to the process of organising the data collected during the research process in a way that one set of information resembles another in certain key aspects (Reichertz, 2005). An important attribute of induction in relation to this study is that of inference where the author was able to state that the presence of certain characteristics within a sample of data infers the logical presence of others, as highlighted within the guidelines that were derived both from the literature as well as the case study.

As mentioned in previous sections there has been much literature published with regards to both SOA and EA, however the aim of this research was to provide a different perspective through the various methods outlined in this chapter. It is not the intention to simply regurgitate previously published literature within this thesis, but rather to try and fill in some of the gaps with regards to how SOA can enable EA. Reichertz (2005) provides support for this approach by highlighting the fact the qualitative induction aims to find only new versions of what is already known, which is the case with SOA and EA.

Klein and Myers (1999) highlighted seven principles that should be considered within an interpretivist study and these have become industry accepted standards for conducting interpretive studies. The principles are summarised in Table 10.

Table 10: Summary of Interpretive Study Principles (Klein & Myer, 1999)

Principle	Summary
The principle of hermeneutic circle	This is the fundamental meta-principle on which the other six principles are based, with the underlying basis being that human beings understand a complex whole by breaking it down into parts and studying the relationships between those parts.
The principle of contextualization	This principle states that all aspects of context need to be taken into account and interpreted accordingly, including location, setting, historical and social aspects.
The principle of interaction between researchers and subjects	This principle addresses the importance of the interaction between the researcher and subjects and also highlights the fact that data produced in interpretive studies are socially constructed. The researcher needs to be weary of the potential pitfalls associated with conflicting roles between the researcher and

	the subject.
The principle of abstraction and generalization	This principle states that researchers interpret data through the application of theories that describe the nature of human understanding and social action.
The principle of dialogical reasoning	This principle states that the researcher has to be sensitive to the possible contradictions between the theoretical preconceptions guiding the research and the design and the actual findings.
The principle of multiple interpretations	This principle states that researchers need to be sensitive to possible differences in interpretations among the participants. It is important that the researcher not discard the different interpretations as this will not allow for a complete and accurate report of the findings.
The principle of suspicion	This principle states that researchers need to understand the “biases” and “distortions” which might be prevalent in the data collected from participants. Researchers should not simply document the information but also need to consider other elements that might have impacted the information received.

The principles highlighted in Table 10 are fundamental in conducting an interpretive study as they support the researcher in carrying out the study. Table 10 indicates that an interpretive study is dependent on context within which data is collected as well as the relationship between the researcher and the subject. The principles also suggests the need for the researcher to ensure that the data is interpreted and not just documented as received due to the fact that there are many external factors that might have an impact on the information. Klein and Myers (1999) also caution the researcher from mechanically implementing the principles as some of them might not be relevant to the study, highlighting the importance of contextualising each principle before use. Finally Klein and Myers (1999) also make it very clear that these principles are guidelines and need to be viewed as such.

One of the important objectives that needed to be achieved in order to successfully complete this research was my ability to interpret all of the data collected with the aim of deriving guidelines for the

implementation of SOA within the context of EA. The literature reviewed in Chapter 2 highlighted the justification of the interpretivist approach used in this research.

3.3. Research Strategy

Villiers (2005) states that the field of information systems research is multi-disciplinary that can be studied utilising a number of different research strategies that span across a number of different domains, including: scientific, technological, engineering, organisational, managerial, psychological, and societal areas. Figure 15 graphically depicts the various research strategies and also highlights the strategies, which fit into the quantitative and qualitative approaches.

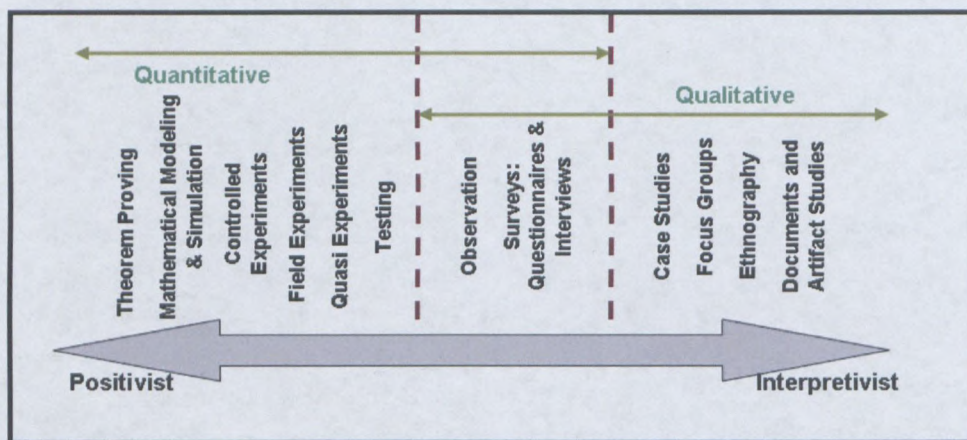


Figure 15: Research Strategies (Villiers, 2005)

Figure 15 also differentiates between the positivist and interpretivist paradigms with regards to research strategies. The research strategy selected for this research was a single case study, using a questionnaire to collect data, and literature as a secondary method and was supported by a final feedback questionnaire that was used as part of the verification technique. Gable (1994) supports this approach by stating that fieldwork alone is a poor method for objectively verifying hypothesis. The feedback questionnaire that was used formed part of the verification technique with the main aim of eliciting feedback on the guidelines that were produced, and their viability in a real world context.

Figure 15 highlighted a number of research strategies; however, this thesis did not delve into an explanation of each one but focused only on relevant strategies. The section that follows provides more detail around the case study strategy as well as highlights the motivation for the research strategy used in this research.

3.3.1. The Case Study as a Research Strategy

Bolan and Mende (2004:6) based on the work by (Yin, 2003) state that “a case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context.”. The case study as a research strategy refers to a group of methods that emphasise qualitative analysis (Yin, 2009), where data is collected from organisations through methods such as “participant-observation, in-depth interviews, and longitudinal studies”(Gable, 1994:113). According to Yin (2009) the case study strategy is especially useful where the boundaries between a phenomenon and its context are not clearly evident. The motivation for a single case study (Yin, 2009) as a research strategy for this research was due to the fact that this method provided sufficient flexibility to study the relationship between SOA and EA without having to control the environment or the participants. (Yin, 2009), provides support for this by stating that case studies are appropriate where the objective is to study events rather than control behavior or variables. The aim of the research is to propose guidelines for SOA to enable EA, in this specific financial services organization, and no attempt was made to generalize the findings for other organizations or industries. Figure 16 displays the research problem and the primary research question that this research addressed.

Research Problem: There is a lack of guidelines for SOA to enable EA resulting in a misalignment of business and IT.

Primary Research Question: What are the guidelines for Service Oriented Architecture to enable Enterprise Architecture?

Figure 16: Research Problem and Primary Research Question for this Study

The phenomenon for this research that Yin (2009) highlights, was addressed by the research problem in Figure 16, and the context for this research was a financial services organization in the Western Cape. This particular organization was selected as the context for this research due to the fact that the organization has implemented both SOA and EA and where finding challenges in linking the two disciplines (**also see 4.2 p. 71**). The SOA initiative was implemented as a technical IT driven project and was currently being used to a very small extent by the business. The EA project was fairly new and was being implemented in isolation to the costly SOA project. This organization provided the ideal environment for a study into possible answers to the primary research question depicted in Figure 16. Furthermore the fact that I was employed as an architect within this organization – allowed the organization to also benefit from the research with practical guidelines that they could utilize in the future (**for more details see chapter 5, section 5.2**).

3.3.2. The Research Process

Figure 17 provides a graphical representation of the high level research process that was followed during this research.

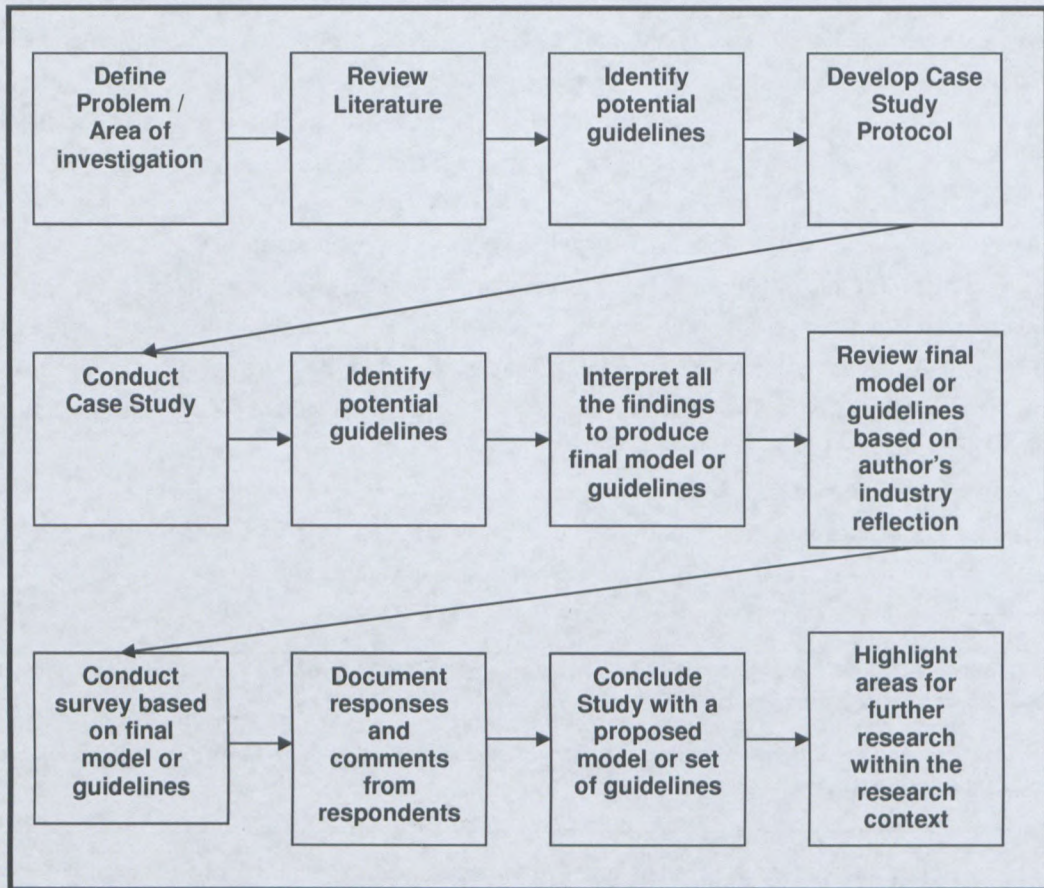


Figure 17: Graphical Representation of High Level Research Strategy (adapted from Gable, 1994)

Figure 17 does not detail every element within the research design process used for this research, but aims to provide the reader with an understanding of how the final guidelines were determined. In summary the process that was followed for involved six phases:

Phase 1: Problem Identification: *There is a lack of guidelines for the alignment of IT and business with regards to SOA.*

Phase 2: Review the Literature: *Provided the theoretical framework for this research as well as established potential guidelines within the literature.*

Phase 3: Analyse data from Case Study: *Established guidelines via the analysis of the case study through interviews with participants.*

Phase 4: Publish final set of guidelines: *Derived final guidelines based on data from the literature and the case study.*

Phase 5: Analysis and Verification: *Analysed final guidelines through the researcher's industry reflection and finally verified the final guidelines using a survey, which involved a questionnaire on the final guidelines.*

Phase 6: Conclusion: *Concluded with a finalised set of guidelines and highlighted areas for further research.*

3.4. Research Design

Eisner (1991) suggests that there is a lack of resources for the step by step design of qualitative research endeavours mainly due to the fact that this methodology focuses on the strengths of the researcher as opposed to standardisation, which is more prevalent in quantitative research. Lincoln and Guba (1985) earlier addressed this particular concern by providing a detailed outline for the design of qualitative research projects. However for the purpose of this thesis, a summary of these steps is provided in Table 11 as outlined by (Hoepfl, 1997) due to the fact that they enhanced Lincoln and Guba's outline, and also provided a more current source.

Table 11: Hoepfl's summary of Research design steps in relation to this Study(adapted from Hoepfl, 1997)

Design Step	Application to this study
Determine a focus for the inquiry.	The focus for this study is the relationship between SOA and EA. The scope of the study is limited to a single case in the financial services industry.
Determine the fit of the research paradigm to the research focus.	This study is a qualitative study that utilizes the Interpretivist paradigm as a means to conduct the study. The rationale for the choice of paradigm is explained in section 3.2.1.2.
Determine where and from whom data will be collected.	The data collection for this study is based on a fourfold strategy, inclusive of a case study with interviews, a literature review, and a reflection by the researcher from industry experience. Being an active practitioner for the last 10 years in the industry comparing his own experience as well as perceptions provided a means to compare the findings of the interviews and the literature. Finally a questionnaire based on the recommendations outlined. Section 3.5 covers this in detail.
Determine what the successive phases of the inquiry will be.	This study follows a very structured approach with section 3.3.2 highlighting this aspect.
Determine what additional instrumentation may be used, beyond the	The main additional instrumentation used was that of the perspective of the

researcher as the human instrument.	interviewees through the case study. Further instrumentation revolves around the verification technique where the recommended guidelines were critiqued by various individuals through a survey.
Plan data collection and recording modes.	This aspect is detailed in section 3.5 outlining the data collection techniques and the tools utilised to gather the information.
Plan which data analysis procedures will be used.	Section 3.6 outlines the data analysis techniques used for this study.
Plan the logistics of data collection, including scheduling and budgeting.	Section 3.5 deals with the logistics and data collection aspect via each of the data collection techniques.
Plan the techniques that will be used to determine trustworthiness.	Section 3.5.3 outlines the trustworthiness techniques with an explanation of the verification technique.

Table 11 provided a high level view of the design of this thesis and where the necessary detail with respect to the various aspects is presented within this document. Hoepfl (1997) also emphasises the importance of the emergent nature of a qualitative study and this aspect should be taken into account when viewing Table 11 as it highlights the fact that although I attempted to follow a structure, being overly rigid would not have suited this type of study. The research design needed to be as adaptable as possible within the allocated budget and timelines.

3.5. Data Collection

Yin (2009) states that there are six sources of evidence most commonly used when doing case study research namely, archival records, interviews, direct observations, participant observations, and physical artefacts. This research collected data from one primary source and one secondary source as outlined below:

- Literature review (secondary source)
- Case Study (primary source)

Yin (2009), also identified three principles for data collection, which are important to the success of case study research. Table 12 highlights Yin's principles and the application to this particular study.

Table 12: Comparison of Yin's Data Collection principles within this Study (Yin, 2009)

Yin's Principles for Data Collection	Application to this study
1. Use multiple sources of evidence	The sources of evidence for this research were the literature review, interviews, and a

	survey.
2. Create a case study database	All of the data for the single case study was captured into a database, the interviews were recorded, the literature was captured into a referencing tool, and the questionnaire responses were captured into a database as well.
3. Maintain a chain of evidence	The databases and the data are referenced and captured within this study.

Yin's principles in Table 12 aim to ensure that the researcher is able to substantiate all of the evidence that he or she has collected when presenting the data for a case study. I applied Yin's principals broadly in the context of this study to ensure that the principles were followed but as per the context of this study. Kaplan and Maxwell (2005) also provide another important principle of qualitative data collection followed in this research, which states that everything that the researcher comes into contact with during a study is potential data, however it is important that the researcher decides carefully as to which data is relevant to the study.

The sections that follow provide more detail with regards to the primary and secondary data sources used for this study.

3.5.1. Literature Review

Marshall and Rossman (1989) describe the purpose of the literature review as follows:

- It establishes evidence for the motivation behind the study and the potential contribution to the scientific body of knowledge.
- It also assists in creating a conceptual framework and possible research questions.

In the context of this research, the main purpose of the literature review was to establish the theoretical framework (relates to Marshall and Rossman) for the study especially with regards to the current state of the aspects being researched. The objectives of the literature review were to establish the following:

- Understand the current status of EA and SOA.
- Understand the relationship between SOA and EA.
- Identify guidelines within the literature in order for SOA to enable EA.

The literature review provided the researcher with an understanding of the current state with regards to EA and SOA, as well as a view as to what guidelines currently exist. It also allowed for the researcher to produce an initial set of guidelines from the literature based on the analysis of the data.

3.5.2. Interviews

One-on-one semi-structured interviews were the primary source of data for this study. The main objective of the interviews was very similar to the literature review in terms of the output required for this research, but the key differentiator was the fact that the interviews provided real-life experience in the context of the organisation that was studied as well as the past experiences of the interviewees.

3.5.2.1. Research Participant Selection

Whitman and Woszcynski (2004) refer to utilising theoretical and convenient sampling when choosing interview participants and this was the approach followed in this study. The participants that were selected needed to be employed in one or more of the roles below within the organisation that was studied:

- Enterprise Architecture professional
- SOA Professional
- Business specific architect
- IT Executive
- Business Executive

The above roles required involvement in business and IT engagements as part of their function, with specific reference to SOA and EA engagements. The roles also focused on aligning EA and SOA engagements from a business and IT perspective. Based on this, the participants that were selected where employed in these roles to provide practical input to the research problem and the research question being investigated in this research. The sampling method used in this thesis to choose both the case and the interview participants is called judgemental sampling. According to (Saunders, Lewis & Thornhill, 1997:145), judgmental sampling “enables you to use your judgment to select cases which will best enable you to answer your research questions and meet your objectives.” This was the most appropriate method given the time constraints as well as the nature of the case study.

As a practitioner researcher being part of the domain where the case study was conducted, it was possible to do a much more in depth study with regards to understanding how SOA can be used as an enabler for EA. The fact that I possessed a great deal of background information on each participant ensured that the participants who were selected had sufficient knowledge in both the SOA, EA, business and IT spaces to provide useful feedback in the interviews. All the selected interviewees were highly qualified and experienced in their respective fields Table 13 depicts the research participant profile for each of the interviewees that were selected for this research.

Table 13: Research Participant Profile

Interviewee	Division	Designation
1	Group Technology Services	Group: Enterprise Architect
2	Group Technology Services	Group: Head of Technology Strategy and Planning
3	Group Technology Services	Group: SOA Architect
4	Group Technology Services	Group: Solutions Architect
5	Group Technology Services	Group: Business & Information Architect
6	Retail	Business Architect
7	Retail	Chief Information Officer
8	Employee Benefits	Business Architect

Table 13 highlights the designation of each interviewee as well as the division in which they worked, to provide background of the individuals. The three largest divisions within the organisation were selected because the majority of the EA and SOA work was being conducted in these areas.

3.5.2.2. Interview Process

As mentioned in section 3.5.2, the purpose of the interviews was to gather the following information in the context of this case study:

- Understand the current status of EA and SOA.
- Understand the relationship between SOA and EA.
- Identify potential guidelines within the literature in order for SOA to enable EA.

A brief discussion was conducted with each of the participants, informing them of the purpose of the study and also requesting whether they would be able to participate in one-on-one interviews for the purpose of gathering data for this research. Upon receiving their verbal consent, subsequent meetings were scheduled with each individual. A brief summary of the purpose of this research was sent within the meeting invite in order to provide the participants with some background information. The interviews were scheduled two to three weeks in advance to allow for the participants to diarise the meetings, given the nature of the environment within the organisation.

The interview guide that was prepared allowed the interviewer to firstly create a context by asking questions related to the interviewees experience and personal definitions of EA and SOA. The interview guide was also created with a number of key words based on the study as well as my organisational experience in order to encourage discussion. Even though the questions were asked in a sequential order, the interviewees were allowed to delve deeper in their responses and many times answered more than one question in their responses.

Even though each participant gave verbal consent to participate in the interview, I clarified this once again at the start of the interview and also made the participant's aware that the interviews were being recorded and asked if they agree. I also made the participants aware that permission had been granted by the organisation to conduct the study. The interviews were all recorded using a NOKIA E71 mobile phone, using the voice recording feature within this device.

All interviews were conducted in English and lasted approximately between 40 minutes to an hour. All of the interviews were conducted on-site at the organisation's head office in the Western Cape. Table 14 highlights the interview schedules for each of the interviews that were conducted.

Table 14: Interview Schedule

Interviewer	Designation	Date	Start Time
1	Group SOA Architect	19/04/2010	09:00
2	Employee Benefits Business Architect	19/04/2010	10:00
3	Retail Business Architect	20/04/2010	08:30
4	Group Business & Information Architect	20/04/2010	11:00
5	Retail Chief Information Officer	20/04/2010	15:00
6	Group Enterprise Architect	21/04/2010	11:00
7	Group Solutions Architect	21/04/2010	14:00
8	Group: Head of Technology Strategy and Planning	22/04/2010	15:00

During the interviews the participants appeared relaxed and forthcoming with information especially with regards to the projects that had previously failed within the organisation. The relaxed attitude can be contributed to the existing relationship with the participants; where there was already trust established based on a history of previous successful projects.

Separate on-line folders were created on a laptop for each participant that included all the data specific to their interview, including the voice recorded files. A CD is included with all interview related files to accompany this research (Appendix A in the table of contents).

3.5.2.3. Interview Questions

For data collection interviews were used as the main data collection techniques, where the interview questions were designed in such a way to ensure that the necessary data was collected for this research. The questions were divided into five major sections with the following objectives:

- Establish individual understanding of key concepts within the study and the basis for their views.
- Identify the relationship between EA and SOA, as well as the relationship between SOA and business strategy and attempt to elicit guidelines for these in general.
- Identify the relationship between EA and SOA from an implementation perspective within this specific organisation to identify any possible relationship between SOA and EA.
- Establish the impact of organisational challenges with regards to SOA and EA.
- Establishing any other aspects that might be related to SOA and EA that the interviewer might have not touched on.

The main objective of the questions was to establish the guidelines for SOA to enable EA; however all of the questions were open-ended to enable the interviewees to explore the questions in more detail as well as to create a platform for further discussion during the interviews. Table 15 provides all of the interview questions that were covered within this study as well as the themes and objectives for each question.

Table 15: Interview Guide

	Interview Question	Theme	Objective
Section 1	1. What is your definition of EA? 2. What is your definition of SOA? 3. Do you consider SOA as a business driver or a technology driver? Why? 4. Do you consider EA a business driver or Technology Driver? Why? 5. Are there any frameworks / industry practices or industry guidelines that you subscribe to with regards to SOA and EA?	Contextualisation and Needs analysis	Establish individual understanding of key concepts and the basis for this.

Section 2	<p>6. Would you categorize SOA and EA to be business concepts or technology concepts? What is the motivation for your view?</p> <p>7. Do you think that there is a relationship between SOA and EA? Please elaborate?</p> <p>8. Do you think that there is a relationship between EA and business strategy? Please elaborate?</p> <p>9. Do you think that there is a relationship between SOA and business strategy? Please elaborate?</p> <p>10. Do you think that SOA can enable EA? What are the guidelines that you would follow to achieve this?</p>	Technology, Strategy and Business Alignment	Identify the relationship between EA and SOA, as well as the relationship between SOA and business strategy and attempt to elicit guidelines for these in general?
Section 3	<p>11. Briefly describe your understanding of the implementation of SOA and EA within this organisation?</p> <p>12. Were these implemented as part of a programme or separately? Why? Do you think that these projects could have been related to each other and how?</p> <p>13. What guidelines would you use to implement SOA and EA?</p> <p>14. If you had to be involved in implementing both SOA and EA, what are the key aspects that you would document in your business case?</p>	Implementation	Identify the relationship between EA and SOA from an implementation perspective within this specific organisation to identify any possible relationship between SOA and EA.
Section 4	<p>15. Do you consider organisational culture or industry to play a role in considering the implementation of SOA and EA?</p> <p>16. What type of organisational structure do you believe is necessary for SOA and EA?</p> <p>17. Should SOA and EA report to the business or CIO? Why?</p> <p>18. Should SOA and EA functions be part of the same department? Why?</p>	Organisational considerations	Establish the impact of organisational issues with regards to SOA and EA.
Section 5	<p>19. Are there any other aspects that you believe need to be considered when looking at the relationship between SOA and EA?</p>	General Considerations	Establishing any other aspects that might be related to SOA and EA that the interviewer might have not asked.

Table 15 also categorises the questions according to a theme as well as the objective that the interviewer aimed to achieve in asking that particular question. Mitchell and Branigan (2000) suggest the use of a topic guide to aid in prompting the researcher with key words that are specific to the study to ensure that discussions around key aspects of the study are taken forward with the interviewees. The interview questions together with the themes and objectives as outlined in Table 15

represented the interview guide, which ensured that important areas were pursued in more detail with the interviewees.

3.5.2.4. Interview Transcription

All of the interviews were recorded in a separate .wav file on a cell phone and thereafter transferred to a laptop in the same format. Each file was then imported into a voice management system to slow down the recordings for transcription purposes. Each recording was transcribed into MS-Word format, where only the responses were captured and not the interviewer's voice since the full recording is provided in Appendix A and I did not deviate from the interview questions that were documented in Table 15. Appendix A also contains the transcriptions of each interview that was conducted, each within a separate folder with the interviewee's designation along with the recorded .wav file.

3.5.3. Verification Technique

The outcome of this research was a set of proposed guidelines for SOA to enable EA, and even though the case study strategy does not dictate the need for verification of the output, I preferred to incorporate a survey to gather whether or not participants believe that the guidelines that were identified were valid.

In the context of this research questionnaires were sent to participants via email and their responses were analyzed using Microsoft Excel. The instructions and background applicable to the guidelines were provided in the mail and included the following:

- A brief background to the study
- The purpose of the study
- Instructions on how to complete the survey.
- Instructions on how to return the survey
- Due date for response to be returned.

The email that was sent out for the survey is documented in Appendix B. The survey that was sent to participants is documented below.

Using a SOA approach in Implementing EA – Survey

Instructions: Please note that there are 10 guidelines in this survey. Please choose a response for each guideline, and enter any comments in the comments box

1. Understand that EA defines an organisation and SOA enables that through the definition of capabilities for the organisation, that are re-usable, flexible and agile.

Christopher Kistasamy
209239409

Agree

Disagree

Don't Know

Comments

2. Although SOA can be considered both a business and technology concept, there needs to always be a link back to business that must be practically displayed whatever the context.

Agree

Disagree

Don't Know

Comments

3. SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business buy-in) in order to see real business benefit.

Agree

Disagree

Don't Know

Comments

4. SOA and EA should not be seen / implemented in isolation to each other since they both have the same objective to deliver tangible value to the business.

Agree

Disagree

Don't Know

Comments

5. Stop thinking about SOA as technology and start thinking about it as a methodology for driving out capabilities.

Agree

Disagree

Don't Know

Comments

6. Use terminology that is relevant to the organisation that business understands and can relate to even it means not using the terms SOA and EA.

Agree

Disagree

Don't Know

Comments

7. Ensure that the scope of your EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with your sponsor along with the success criteria that the solutions will be measured against.

Agree

Disagree

Don't Know

Comments

8. Clearly define what architecture artefacts SOA will deliver as well as those that EA will deliver, to avoid duplication and ensure that these two disciplines complement each other, and most importantly that the links back to business are clearly articulated.

Agree

Disagree

Don't Know

Comments

9. Clearly define roles and responsibilities need to be defined for both SOA roles and EA roles, so as to ensure that both teams are working towards the same objectives especially with regards to linking business and IT.

Agree

Disagree

Don't Know

Comments

10. Clearly define what SOA and EA are specific to the organisation as well as what each will deliver to the organisation. This should be enshrined as a group wide business and IT principle against which SOA and EA endeavours are measured.

Agree

Disagree

Don't Know

Comments

The above survey was sent out to 15 participants, all who have background in SOA and EA, and are employed in large corporations. In order to ensure accuracy and no bias, the respondents were only sent an email, asking them to respond to the survey, and were not given detail in terms of the study except for what the guidelines are used. The reason for this was that I wanted to establish whether the guidelines that were developed could be used by these individuals as part of the daily work, and didn't want to influence them by providing too much information. The detailed result of the survey that was sent out is documented in Appendix C, and a discussion of the results is provided in Chapter 5.

3.6. Data Analysis

Bailey (2008) states that the first step in analysing data collected in a study is the representation of that data in written form. As mentioned in the previous sections all of the data that was collected was transcribed or documented in MS-Word. The second method for data analysis that was used in this research is that of summarising all of the data collected and looking for emergent themes. Ratcliff (2004) provided support for this method by stating that this method allowed the researcher to look at documents, text or speech to see what themes emerged. The underlying principle that I used to analyse the data was to look at recurring themes within the literature as well as the case study and to identify whether those recurring themes had support from both the literature review and the participants within the case study.

All the data collected in the literature and the case study was analysed in this way, where the text was labelled to identify recurring themes or key words that could be used as guidelines for SOA to enable EA. As mentioned in Chapter 2 the literature review was divided into a number of categories, where a mini literature review was done on each category, ensuring a comprehensive reflection of the literature within the context of this study. There were some categories that were deemed irrelevant for the study and were left out of the research; however the literature reviews for these aspects are also captured in Appendix D. Table 16 highlights the themes as well as the categories that were looked at during the literature review, with the aim of eliciting some guidelines for SOA to enable EA.

Table 16: Literature Themes and Categories

Themes	Categories
<ul style="list-style-type: none">• Alignment of Business and IT• EA Definitions• EA and Business Strategy• Guidelines for SOA to enable EA.	Enterprise Architecture
<ul style="list-style-type: none">• Alignment of Business and IT• SOA Definitions	Service Oriented Architecture

<ul style="list-style-type: none"> • SOA and Business Strategy • Guidelines for SOA to enable EA 	
<ul style="list-style-type: none"> • Alignment of Business and IT • Relationship between SOA and EA • Guidelines for SOA to enable EA 	SOA & EA

The categories documented in Table 16, are the same categories reflected in chapter 2 as areas which the literature study focused on, however the themes highlighted formed the important areas that needed to be investigated through the literature.

In terms of the case study, a similar approach was followed (refer to chapter 4), where recurring themes were documented and validated against the participant's responses to gauge which themes were more supported than others. The themes that were most supported were then synthesised into guidelines and these were later verified through a questionnaire that was sent out to industry practitioners to determine the applicability of the guidelines that were put forward.

3.7. Ethical Considerations

The most important ethical considerations that a researcher must take into account in case study research is to ensure that informed consent was obtained from the participants and that the privacy of the research participant is always maintained (Leedy & Ormrod, 1989). These aspects were taken into account in this study and all of the participants were fully aware of all aspects relating to the study, and their consent was also obtained, both from the participants and representatives of the organisation, prior to commencement of any engagement with them. During the time of the interviews, I was working within the Group Architecture team within this organisation, so I had full access to all of the Group Architects, as we were colleagues, and had an excellent working relationship. In terms of the other architects and CIO's from the business, they were my internal customers, which meant that I also interacted with many of them on a regular basis. I also believe that the participants trusted me in terms of their working relationship and this created a very open communication environment, which is depicted, in the open responses I received during the interviews.

Furthermore, no names of the participants or even the name of the organisation were used anywhere within this document in order to ensure that the privacy of the participants as well as the organisation is maintained.

3.8. Summary

This chapter detailed the research methodology and design for this research. The chapter began with an introduction into research methodologies and then delved into more detail around the qualitative research methodology, which was used for this study. The section that followed then highlighted the various research paradigms within qualitative research and also specifically detailed the Interpretivist paradigm as used in this study. The next section then discussed the research strategies available within qualitative research with specific focus on the case study as a research strategy, as used within this study. The research process was also discussed within this section and was followed by a discussion on the research design that was followed for this study.

A section on data collection was also discussed, detailing how the data was collected for this study, inclusive of the verification technique that was used. The final section focused on how the data was analysed for the study as well as the ethical considerations that needed to be taken into account when embarking on case study research.

4. Case Study: Findings

4.1. Introduction

This chapter presents the analysis of the data collected during the data collection activities within the case study environment. In order to ensure a balanced view in terms of the research, it was imperative to find data within the context of a real world example to compare against the data found in the literature review. To this end a case study, with data collection done in the form of semi-structured interviews was conducted within a large financial services company in the Western Cape. The sections that follow give feedback of the data collected during the case study.

In this chapter the focus was on the following research sub questions in the context of the case study:

- What is the relationship between SOA and EA?
- What are the guidelines to consider for SOA to enable EA according to industry practitioners?

The transcripts of the interviews as well as the recordings were shared with the interview participants for their reference. Figure 18 graphically represents the structure of Chapter 4.

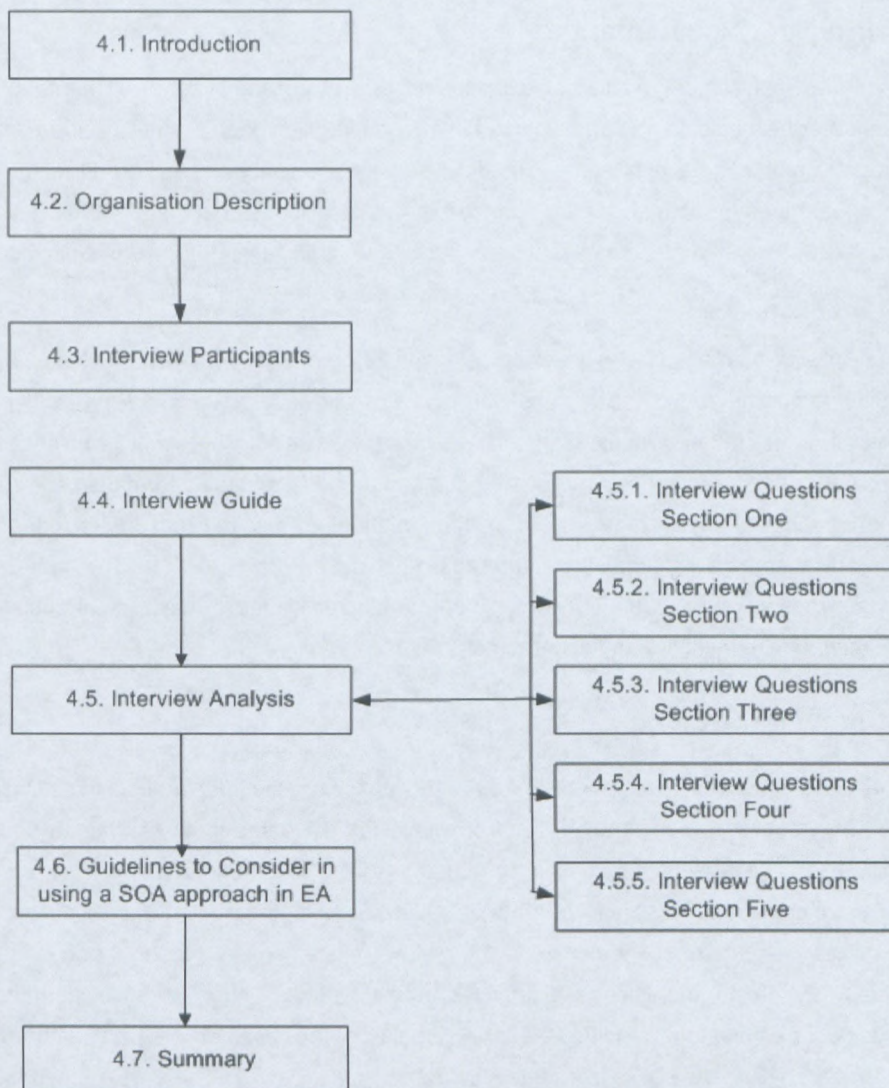


Figure 18: Graphical Representation of Chapter 4

4.2. Organisation Description

The organisation that was chosen as a case study for this thesis is a large Financial Services organisation in the Western Cape. The organisation has offices throughout South Africa, as well as a large presence in Africa. There are approximately 12000 employees throughout and the customer base is both the private and the public sector. The organisation is very well established and is one of the longest serving operations in South Africa, having been established for almost a century. There organisation is made up of a very large Retail division serving both the corporate sector as well as individual customers, but also specialising in more specific products for investment as well as Group Schemes. The reasoning behind the choice of this particular organisation as a case study is explained in more detail in chapter 3 (section 3.3.1 page 56).

4.3. Interview Participants

The criteria for the selection of the interview participants were discussed in detail in Chapter 3, section 3.5.2.1. The individuals selected as participants have all been involved in both SOA and EA projects within the organisation and have immense experience from a practical perspective. Table 13 (section 3.5.2.1, page 62) gives a summary of the interviewee profile discussed in section 3.5.2.1, including the division as well as the designation for each of the participants that were selected for the interviews.

The interview participants selected were a combination of both senior management employees as well as senior architects within the organisation and this allowed me to focus on both technical aspects as well as the more strategic elements within the interviews. There was a balanced mix of both business and IT representatives in order to get a comprehensive finding from the case study and the participants selected allowed me to achieve this balance. One of the reasons for choosing this particular organisation as a case study was that the organisation practiced both SOA and EA, but a more important reason was that the interviews were conducted during a major implementation of a group wide enterprise architecture that incorporated SOA.

4.4. Interview Guide

In order to create a cordial environment for the interview, Yin (2003:90) argues that “Case study interviews require the researcher to operate on two levels at the same time: satisfying the needs of your inquiry while simultaneously putting forth non-threatening interview questions.” In order to be able to achieve the two levels as described by Yin (2009), it is imperative that the researcher is well equipped with all the necessary tools for the interview. The interview guide is one of the most important elements of the interview as it provides the researcher with a guide for conducting the interviews as well as ensuring that all of the main aspects of the research are dealt with during the interview. The interview guide was presented in detail in Chapter 3 (Table 15), inclusive of the themes, questions, and objectives that were explored in the interviews. As mentioned in Chapter 3 the questions covered in the interview aimed to achieve the objectives outlined below with the main idea that I would be able to extract potential guidelines that could be used for SOA to enable EA. The objectives were to:

- Establish individual understanding of key concepts within the study and the basis for their views.
- Identify the relationship between EA and SOA, as well as the relationship between SOA and business strategy and attempt to elicit guidelines for these in general.
- Identify the relationship between EA and SOA from an implementation perspective within this specific organisation to identify any possible relationship between SOA and EA.
- Establish the impact of organisational challenges with regards to SOA and EA.
- Establishing any other aspects that might be related to SOA and EA that the interviewer might have not touched on.

The questions in the interview guide were distributed to the interviewees prior to the interview with the main aim of ensuring that where questions required specific information with regards to the organisation, the participants had sufficient time to find the detail and prepare adequately. However, preparation was not mandatory and the participants that did not prepare did not reflect differently on the questions. It was imperative that given the one hour time constraint for each interview, that time was utilised very effectively, and by providing the interviewees with the background material allowed participants to prepare as well as allowed me to get through all of the aspects required.

The interview guide was the only document taken into the interview and this allowed me to ensure that all questions were covered as well as being able to delve into any other aspects that might have emerged up during the interview that were not covered by the interview questions. Section 4.4 delves into the details of each interview providing the questions as well as a summary of the key themes from each of the responses and a discussion of the findings.

For **reference purposes** the Interview Guide discussed in Chapter 3 – Table 15 is duplicated below:

	Interview Question	Theme	Objective
Section 1	<ol style="list-style-type: none"> 1. What is your definition of EA? 2. What is your definition of SOA? 3. Do you consider SOA as a business driver or a technology driver? Why? 4. Do you consider EA a business driver or Technology Driver? Why? 5. Are there any frameworks / industry practices or industry guidelines that you subscribe to with regards to SOA and EA? 	Contextualisation and Needs analysis	Establish individual understanding of key concepts and the basis for this.
Section 2	<ol style="list-style-type: none"> 6. Would you categorize SOA and EA to be business concepts or technology concepts? What is the motivation for your view? 7. Do you think that there is a relationship between SOA and EA? Please elaborate? 8. Do you think that there is a relationship between EA and business strategy? Please elaborate? 9. Do you think that there is a relationship between SOA and business strategy? Please elaborate? 10. Do you think that SOA can enable EA? What are the guidelines that you would follow to achieve this? 	Technology, Strategy and Business Alignment	Identify the relationship between EA and SOA, as well as the relationship between SOA and business strategy and attempt to elicit guidelines for these in general?

Section 3	<p>11. Briefly describe your understanding of the implementation of SOA and EA within this organisation?</p> <p>12. Were these implemented as part of a programme or separately? Why? Do you think that these projects could have been related to each other and how?</p> <p>13. What guidelines would you use to implement SOA and EA?</p> <p>14. If you had to be involved in implementing both SOA and EA, what are the key aspects that you would document in your business case?</p>	Implementation	Identify the relationship between EA and SOA from an implementation perspective within this specific organisation to identify any possible relationship between SOA and EA.
Section 4	<p>15. Do you consider organisational culture or industry to play a role in considering the implementation of SOA and EA?</p> <p>16. What type of organisational structure do you believe is necessary for SOA and EA?</p> <p>17. Should SOA and EA report to the business or CIO? Why?</p> <p>18. Should SOA and EA functions be part of the same department? Why?</p>	Organisational considerations	Establish the impact of organisational issues with regards to SOA and EA.
Section 5	<p>19. Are there any other aspects that you believe need to be considered when looking at the relationship between SOA and EA?</p>	General Considerations	Establishing any other aspects that might be related to SOA and EA that the interviewer might have not asked.

4.5. Interview Analysis

This section provides details in terms of the interviews that were conducted at the financial services organisation. Section 4.1 provides a view of the interviewees in terms of the division that they worked for as well as their designation and the motivation for selection. The number for each interview response corresponds to the numbering as per Table 13 in Chapter 3 and repeated in section 4.2.

4.5.1. Interview Questions Section 1

This section consists of five questions with the main objective of establishing each of the participants understanding of the key concepts with regards to this research. The theme for Section 1 was defined as contextualisation and needs analysis, and the main idea was to ensure that the interviewees could articulate their definitions of some of the key concepts such as SOA and EA. This section allowed me to establish each of the participant's contexts for the remainder of the interview as well as to

understand what their drivers were with regards to their definitions. Table 17 provides the question that was asked during the interview and a summary of the key response that were highlighted by the interviewees.

Table 17: Summary of Question and Responses for Question 1

Question	Key Theme from Respondents
<p style="text-align: center;">What is your definition of EA?</p>	<p>Interview Guide Key Theme: Contextualisation and Needs Analysis.</p> <ul style="list-style-type: none"> • “Alignment of business strategy and implementation” • “Blueprint of the organisation” • “Provides guidance to an organisation in term of direction” • “Simplifying the complexity within an organisation” • “Problem definition”

EA is a fundamental concept within this research and the purpose of Question 1 was to derive an understanding from an organisational perspective as to the definition of EA. This was also done in Chapter 2 to define the theoretical understanding and in this chapter the aim was to define an understanding from a practical perspective. Some of the themes that were derived are highlighted above, but in summary the overall consensus from all of the respondents was that EA is used to represent many perspectives of an organisation, with the view of highlighting the links between aspects. The respondents also noted that the representation of organisational aspects can be used for different objectives depending on the goal of EA within an organisation.

Schekkerman (2006a) stated that EA is about understanding all of the elements of an enterprise and how they relate to each other. Schekkerman’s definition was used for this research and the interviewees provided a very similar view in their definition of EA, which highlighted the fact that industry and academia have similar views with regard to the understanding of EA.

Table 18 highlights Question 2 as well as a summary of the key themes in terms of the responses. As with EA, SOA is also a fundamental concept within this research, and the purpose of Question 2 was derive an understanding form the practitioners as to their definition of SOA.

Table 18: Summary of Question and Responses for Question 2

Question	Summary of Key Theme from Respondents
<p style="text-align: center;">What is your definition of SOA?</p>	<p>Interview Guide Key Theme: Contextualisation and Needs Analysis.</p>

	<ul style="list-style-type: none"> • “SOA is a style of architecture, and derives its input from EA” • “SOA is operational in all architecture domains, and is driven by business capabilities” • “SOA is about modelling your organisation in terms of services provided” • “SOA is an IT architectural style based on agility and flexibility.” • “SOA is a framework for solution design”
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The interviewees had varying perspectives in terms of SOA, with some of the respondents highlighting that SOA is more focused on IT aspects, while others were of the view that SOA can be used in any domain. Most of the respondents did however agree that SOA provides a framework for organisations to structure their capabilities in line with the services they provide to customers, be it internally or externally. The definition of SOA, that was used in this research based on the work by (Marks & Bell, 2006), stated that SOA is a conceptual business architecture, that focused on exposing business functionality, or application logic to consumers. As highlighted earlier on in this section, the participants had varying opinions with regards to SOA. However the view that was shared by Marks & Bell (2006), was also echoed by some of the participants within the interviews. The fact that both the literature and some of the practitioners shared similar views allowed me to spend more time on eliciting guidelines as opposed to spending time explaining concepts, which was not the main purpose of the interviews.

Table 19 highlights Question 3 as well as a summary of the key themes in terms of the responses. The purpose of Question 3 was to elicit a view from the interviewees as to whether they perceived SOA as a business or technology driver and the reasons for their views.

Table 19: Summary of Question and Responses for Question 3

Question	Summary of Key Theme from Respondents
<p>Do you consider SOA as a business driver or a technology driver? Why?</p>	<p><u>Interview Guide Key Theme:</u> Contextualisation and Needs Analysis.</p> <ul style="list-style-type: none"> • “SOA is a business driver. It’s a tail wagging the dog scenario if it’s looked at as a technology driver.” • SOA is technology driven – business

	<p>people don't understand technology enough to see it as anything different"</p> <ul style="list-style-type: none"> • SOA is both a business and technology driver depending on the perspective with which one looks at it"
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Some of the interviewees had very strong views that SOA is a business driver, and that any other way of looking at SOA defeated the purpose of the concept. This perspective was not shared amongst all of the participants, with some viewing SOA as purely technology driven and others viewing SOA as a mixture of both IT and business drivers, depending on the perspective. The interviewees had different views based on their positions within the organisations and the challenges faced within these areas with regards to SOA and EA. It was also interesting to note that those one of the interviewees representing a major business area was adamant that SOA was purely technology driven. Question 3 was important in determining the underlying perspective of each of the interviewees in terms of how they perceived SOA in the organisation and from their viewpoint. It was interesting that what was being implemented in the organisation clearly denoted that SOA was a technology driver, which contradicted the views of some of the interviewees, but they did mention that the drivers for implementing SOA within the organisation were not necessarily industry best practice.

Table 20 highlights Question 4 as well as a summary of the key themes in terms of the responses. The purpose of Question 4 was to elicit a view from the interviewees as to whether they perceived EA as a business or technology driver and the reasons for their views.

Table 20: Summary of Question and Responses for Question 4

Question	Summary of Key Theme from Respondents
<p>Do you consider EA a business driver or Technology Driver? Why?</p>	<p><u>Interview Guide Key Theme:</u> Contextualisation and Needs Analysis.</p> <ul style="list-style-type: none"> • "EA is definitely a business driver. It is about creating a picture of the organisation from a business point of view." • "EA was initially focussed on technology but no there is a clear shift towards a business view, reflecting the increased profile of IT." • "EA is both business and technology. I don't see how EA can work without business or technology."

	<ul style="list-style-type: none"> • “EA should not be seen as a driver but rather as a way of life”
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Most of the interviewees viewed EA as a business driver, however there were some that considered EA to be a technology driver. There was also a view that EA is both a technology and business driver due to the fact that organisations are inclusive of both business and technology elements, and this did not allow for EA to be one or the other. An interesting aspect that was also raised during the interviews was the shift that was being noticed by the interviewees, where EA was moving out of the technology era, and focusing much more on the business aspects. The interviewee highlighted that this also should be seen as an increase in the strategic nature of IT, and the more visibility that the discipline was receiving. One of the interviewees challenged the question, by stating that EA should not be seen as a driver at all. According to the interviewee, EA is a way of life and needs to be practiced as such, by making it part of our inherent thinking and not creating a category within which to place the concept. This response is supported by Lapalme (2011) who highlights the fact that one of the schools of EA drives organisational innovation as a means to alignment between all areas of the organisation. In Chapter 1 of this thesis, I state that there are three schools of EA according to Lapalme (2011), and the responses received from the interviewees highlight the fact that there are many views with regards to EA.

Table 21 highlights Question 5 as well as a summary of the key themes in terms of the responses. The purpose of Question 5 was to investigate the frameworks that the interviewees used or subscribed to in terms of their experience.

Table 21: Summary of Question and Responses for Question 5

Question	Summary of Key Theme from Respondents
<p>Are there any frameworks / industry practices or industry guidelines that you subscribe to with regards to SOA and EA?</p>	<p>Interview Guide Key Theme: Contextualisation and Needs Analysis.</p> <ul style="list-style-type: none"> • EA frameworks – TOGAF, Zachman, Lean, Six Sigma, Aris. • SOA – OMG, IBM AIA, EAI • “EA and SOA are ways of thinking – I do not subscribe to any frameworks”

TOGAF and Zachman were popular amongst the interviewees, and most of them had come across these two frameworks. There were some other interesting types of frameworks that were mentioned in terms of EA such as Aris, Six Sigma, and Lean, which are much more focused on process architecture and strategy development; however some of the interviewees used these to develop their EA artefacts as well. In terms of SOA, the interviewees did not have strong views on any particular

framework, since many of them were not aware of such frameworks, however there were some frameworks mentioned such as those depicted in Table 20. Two of the respondent's highlighted the fact that they did not subscribe to any frameworks as they believed that EA and SOA are ways of thinking and that frameworks did not add value from that perspective. Based on these responses, there seems to be new thinking in terms of how EA and SOA are perceived today, highlighting the fact that EA and SOA have been traditionally sold based on the value of the frameworks such as Zachman and TOGAF, but that seems to be changing, in line with the proposals of this thesis, as well as the findings of Lapalme (2011).

As mentioned in the previous sections, the above interview questions, which formed Section 1 of the interview, were used as an introduction to the interview in order to establish a context for both the interviewees and myself, and also to elicit definitions of the key concepts namely EA and SOA, from the interviewees' perspectives. The main aspects that were derived from this section of the interview was the interviewees views in terms of EA and SOA as well as whether they viewed the concepts as part of the business or IT domains. I also delved into the types of frameworks utilised by the interviewees to gather a more practical view on how the interviewees used EA and SOA. In terms of this research, a similar approach was followed in Chapter 2, to determine a perspective from the literature as to what EA and SOA are.

The objective of Section 1 of the interview questions was to establish the individual understanding of the key concepts within this study and the basis for their views. In terms of EA and SOA, the interviewees provided a clear definition of the concepts from their individual perspectives, and they were also able to substantiate their views throughout the remainder of the section questions. It is interesting that given the fact that the interviewees had both experienced SOA and EA projects within the company, their views on the definitions were different to the definitions of what EA and SOA was based on the implementations that had taken place within the organisation. This created a basis for an interesting discussion, and allowed me to delve into more detail in the sections that followed which specifically investigated EA and SOA from an implementations perspective. The interesting aspect that was noted was the fact that some of the interviewees did not agree with how SOA and EA had been implemented even though some of them were part of the implementations, and this was due to the fact that in some instances SOA and EA were done out of a technology want, as opposed to a business need.

I also noted the varying definitions in terms of the roles of the interviewees within the organisation where some of the interviewees that worked in the IT areas highlighted the fact that business was not supportive enough of EA and SOA due to their lack of understanding of the concepts, and some of the interviewees that worked in the business areas felt that IT was not driving EA and SOA from a business perspective. This highlighted the lack of alignment between business and IT, and also very clearly highlighted the lack of communication between the business and IT within this organisation.

4.5.2. Interview Questions Section 2

This section consists of five questions with the main objective of identifying the relationship between EA and SOA, as well as the relationship between SOA, EA and business strategy and attempt to elicit guidelines for these in general. The theme for Section 2 was defined as technology, strategy and business alignment, and the main idea was to ensure that the interviewees could provide their insight in terms of the relationship between SOA and EA, based on their experience. This section allowed me to gather data on the relationship between SOA and EA, based on industry views, and personal experience from each of the participants.

Table 22 highlights Question 6 as well as a summary of the key themes in terms of the responses. The purpose of Question 6 was to investigate whether the interviewees viewed SOA and EA as business or technology concepts, as well as the motivation for their views. Although there was repetition of some aspects from Section 1 of the interview guide, the theme in this section was different.

Table 22: Summary of Question and Responses for Question 6

Question	Summary of Key Theme from Respondents
<p>Would you categorize SOA and EA to be business concepts or technology concepts? What is the motivation for your view?</p>	<p><u>Interview Guide Key Theme:</u> Technology, Strategy and Business Alignment.</p> <ul style="list-style-type: none"> • “Lack of alignment between SOA, EA and business strategy.SOA is more within the IT space and EA is in between.” • “Both should be business concepts but business does not understand these concepts so they cannot take ownership of them.” • “SOA and EA are IT concepts.”

This question was a source of an interesting discussion, as there were many views as to whether SOA and EA were technology concepts or not. The majority of the participants viewed both EA and SOA as business concepts; however there were some participants that highlighted that this was not a clear cut aspect, and viewed SOA and EA as a bit of both. There was 1 interviewee that viewed SOA and EA as a purely IT concept, which was a variation from the norm in terms of responses received, however the fact that this individual was very highly ranked within the organisation provided some perspective as to the state of SOA within the organisation, where most of the work that was being done was at a technical level, rather than at a business level. This individual was from the retail business area, where sales targets where an important driver, and SOA was being used in this space

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to drive out IT solutions faster, to meet the sales targets, and things like alignment to business strategy were a secondary consideration in this context (**Also see guideline 3 and 6 in table 36, page 93**).

Table 23 highlights Question 7 as well as a summary of the key themes in terms of the responses. The purpose of Question 7 was to investigate whether there was a relationship between SOA and EA from a generalist perspective, based on the interviewees experience with these concepts.

Table 23: Summary of Question and Responses for Question 7

Question	Summary of Key Theme from Respondents
<p>Do you think that there is a relationship between SOA and EA? Please elaborate?</p>	<p><u>Interview Guide Key Theme:</u> Technology, Strategy and Business Alignment.</p> <ul style="list-style-type: none"> • “Definitely, SOA assist EA in driving out the business capabilities.” • “SOA can assist in implementing EA, which can create alignment between business and IT.” • “EA represents the organisation at various levels, most importantly the strategy level, and SOA represents the delivery model.” • “EA is the theory and SOA validated that theory though practical representations which can then be validated by business.” • “SOA is an EA domain.”

The interviewees all agreed that there was definitely a relationship between SOA and EA; however the motivation for their views did vary quite substantially. I believe this was due to their different positions within the organisation, as well as their tenure there, and finally the immediate challenges that they were experiencing in terms of the SOA and EA initiatives. There was a lot of reference to the practical representation of business strategy, which was where SOA was viewed as having its greatest influence. EA was described more from a strategic perspective with its influence heavily focused on representing and defining strategy.

Table 24 highlights Question 8 as well as a summary of the key themes in terms of the responses. The purpose of Question 8 was to investigate whether there was a relationship between EA and business strategy.

Table 24: Summary of Question and Responses for Question 8

Question	Summary of Key Theme from Respondents
<p>Do you think that there is a relationship between EA and business strategy? Please elaborate?</p>	<p><u>Interview Guide Key Theme:</u> Technology, Strategy and Business Alignment.</p> <ul style="list-style-type: none"> • “Definitely, EA should be a strategic function in business and not even be housed within IT.” • “Business Architecture is one of the domains of EA that directly involves input from business strategy.” • “EA is a sanity checker for business strategy.” • “EA is a business tool and practitioners need to communicate that message back to business”

The interviewees were once again unanimous in their response to Question 8, as they indicated the relationship between EA and business strategy, even to the extent of highlighting that EA is actually a major component of the communication of business strategy. It was also interesting that some of the participants viewed EA as a function within business, and didn't see EA as an IT function at all. The issue of lack of understanding from business as to the definition of EA was also highlighted as an issue once again in Question 8. The difference in opinion was largely due to the fact that all of the EA and SOA initiatives were under the ambit of the IT areas, resulting in these projects seen as IT projects rather than business projects. The business was seen as input into these projects rather than owners and thus did not understand the value of EA and SOA.

Table 25 highlights Question 9 as well as a summary of the key themes in terms of the responses. The purpose of Question 9 was to investigate whether there was a relationship between SOA and business strategy.

Table 25: Summary of Question and Responses for Question 9

Question	Summary of Key Theme from Respondents
<p>Do you think that there is a relationship between SOA and business strategy? Please elaborate?</p>	<p><u>Interview Guide Key Theme:</u> Technology, Strategy and Business Alignment.</p> <ul style="list-style-type: none"> • “No. There is an indirect relationship between SOA and business strategy through EA.” • “Definitely, especially where

	<p>organisations are looking for agility and flexibility, integration etc.”</p> <ul style="list-style-type: none"> • “No. SOA is implementation specific.”
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The interviewees highlighted some interesting aspects in Question 9, especially within the context of this study. There were certainly mixed reactions to Question 9 with some interviewees highlighting the fact that there was definitely a relationship between SOA and business strategy, but that the relationship was indirect, through EA. There were some of the interviewees that did not see any link between SOA and business strategy, as they believed it to be implementation specific.

Table 26 highlights Question 10 as well as a summary of the key themes in terms of the responses. The purpose of Question 10 was directly related to the purpose of this study, which was to investigate how SOA can enable EA, and the guidelines to follow to achieve this enablement. Question 10 was the last question in this section.

Table 26: Summary of Question and Responses for Question 10

Question	Summary of Key Theme from Respondents
<p>Do you think that SOA can enable EA? What are the guidelines that you would follow to achieve this?</p>	<p><u>Interview Guide Key Theme:</u> Technology, Strategy and Business Alignment.</p> <ul style="list-style-type: none"> • “Yes it can. Define business aspects that are opportunities for SOA.” • “Ensure that there is a close relationship between SOA and EA strategies. EA must drive SOA.” • “Build the business case around aspects such as flexibility, agility, and usability.” • “Drive the outputs from a target operating model and business capability perspective.”

The interviewees agreed that SOA can enable EA – this was an important aspect to establish, as this was a fundamental basis for the guidelines. A key theme that was highlighted from most of the interviewees was the importance of business input in order for SOA to enable EA, in fact this aspect was highlighted as a non-negotiable aspect, and it was made clear SOA and EA initiatives will fail without business input and drive.

Section 2 of the interview questions was aimed at establishing the interviewee’s perspective in terms of business and IT alignment, with regards to SOA and EA. There were some very specific themes that were highlighted throughout this section of the interviews, especially the theme of business

involvement. The business needs to take more responsibility within the alignment discussion as business strategy should drive every aspect of an organisation. Another key theme that was highlighted was the lack of communication between practitioners and business, especially with regards to creating awareness and understanding of EA and SOA and the benefits that could potentially be derived from adopting these concepts within organisations. The relationship between SOA and EA was also dealt with as part of this section, and I noted that although the interviewees were very certain about the fact that a relationship exists, they were not in agreement as to what the relationship was, with varying views and perspectives, and therefore the importance of a set of guideline is necessary to assist in defining the relationship between SOA and EA.

The interviewees also stated that SOA can be used as an enabler for EA, highlighting various aspects to consider in terms of guidelines with regards to Section 2. These themes were not included in the interview guide and should be added to the themes that I thought important and included in the interview guide. These were themes that were highlighted across all of the interview responses analysed namely:

- Importance of Business input.
- EA should drive SOA.
- Communication.

The interviewees also highlighted the fact that there needed to be clear deliverables and success criteria at the conceptualisation of both SOA and EA projects to ensure that the projects succeed as well as to be able to provide the business with performance indicators with which to measure the extent of the success.

4.5.3. Interview Questions Section 3

This section consists of four questions with the main objective of identifying the relationship between EA and SOA from an implementation perspective within this specific organisation as well as attempting to elicit guidelines for these from an implementation perspective. The theme for Section 3 was defined as implementation, and the main goal was to ensure that the interviewees could provide their insight in terms of the relationship between SOA and EA, based on their practical experience in this organisation. This section allowed me to gather data on the relationship between SOA and EA, from a project perspective, using real world examples.

Table 27 highlights Question 11 as well as a summary of the key themes in terms of the responses. The purpose of Question 11 was to gather an understanding of the interviewees experience in terms of the organisation that was being studied.

Table 27: Summary of Question and Responses for Question 11

Question	Summary of Key Theme from Respondents								
Briefly describe your understanding of the implementation of SOA and EA within this	<table border="1"> <thead> <tr> <th data-bbox="741 1838 943 1871">Interview</th> <th data-bbox="943 1838 1064 1871">Guide</th> <th data-bbox="1064 1838 1185 1871">Key</th> <th data-bbox="1185 1838 1284 1871">Theme:</th> </tr> </thead> <tbody> <tr> <td colspan="4" data-bbox="741 1871 1284 1922">Implementation</td> </tr> </tbody> </table>	Interview	Guide	Key	Theme:	Implementation			
Interview	Guide	Key	Theme:						
Implementation									

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<p>organisation?</p>	<ul style="list-style-type: none"> • “SOA was a progression from Enterprise Application Integration – driven as a technical resolution to the legacy systems. They were many attempts at EA over the years but the current project is truly doing EA – the others were more technically focused rather than business focused.” • “SOA was focused on traditional SOA perspectives, heavily driven by IT.” • “Very unhealthy state – lack of business strategy and business support.” • “EA practice is still maturing but is gaining good momentum.” • “Maturity of the organisation is still growing, and as this progresses, things will get better.” • “Business needs have changed drastically to the time when these aspects were initially looked at.”
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The interviewees were very emotional about this question, and it was clear that the architects that were in the organisation for a long time, seemed a bit defensive about what was in place as opposed to the architects who had recently joined the organisation who criticised certain aspects much more openly. In my opinion, this defensiveness was due to the fact that the architects that were in the organisation for longer periods didn't want to be seen as though their previous efforts were wasted, and felt this question more as a personal attack on their work. SOA and EA had been in the organisation for a long time, but during the interviews, it seemed that there was much more drive within the organisation due to the changing perspective of what these concepts were being defined as with the current projects.

Table 28 highlights Question 12 as well as a summary of the key themes in terms of the responses. The purpose of Question 12 was to gather an understanding of the alignment of SOA and EA from a project perspective.

Table 28: Summary of Question and Responses for Question 12

Question	Summary of Key Theme from Respondents
<p>Were these implemented as part of a programme or separately? Why?</p>	<p><u>Interview Guide Key Theme:</u> Implementation</p>

<p>Do you think that these projects could have been related to each other and how?</p>	<ul style="list-style-type: none"> • “SOA and EA were implemented separately. The projects could have been implemented together, but the problem was that they were seen by the business as another IT project and nothing more than that.” • “The projects were implemented separately – could have been related by starting off with EA and then determining opportunities for SOA involvement.” • “SOA and EA were to highlight synergies not looked at as projects but rather as solutions to some specific business problems, and could have potentially been looked at together.”
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Question 12 was focused on determining whether the interviewees had noticed any synergies between the SOA and EA projects that were implemented within the organisation and whether there were any potential opportunities that could have been exploited if the SOA and EA projects were implemented together. The key theme in Question 12 was that most interviewees pointed out that SOA and EA were viewed as totally separate aspects when they were implemented at the organisation, and thus the need for synergies was overlooked. The reason for this was that the requirements were looked at in isolation, since there was not a Group Architecture area responsible for this, as was the case when the interviews were conducted. In the previous implementations architects in the business units were responsible for the business unit implementations, and did not pay attention to synergies as this was not important at that time. The organisation was focusing on re-looking at SOA and EA from a more strategic perspective in the future.

Table 29 highlights Question 13 as well as a summary of the key themes in terms of the responses. The purpose of Question 13 was to gather an understanding of the guidelines that the interviewees would use to implement SOA and EA.

Table 29: Summary of Question and Responses for Question 13

Question	Summary of Key Theme from Respondents								
<p>What guidelines would you use to implement SOA and EA?</p>	<table border="1"> <thead> <tr> <th data-bbox="783 1720 899 1752">Interview</th> <th data-bbox="943 1720 1030 1752">Guide</th> <th data-bbox="1074 1720 1132 1752">Key</th> <th data-bbox="1176 1720 1263 1752">Theme:</th> </tr> </thead> <tbody> <tr> <td colspan="4" data-bbox="783 1752 1263 1849">Implementation</td> </tr> </tbody> </table>	Interview	Guide	Key	Theme:	Implementation			
Interview	Guide	Key	Theme:						
Implementation									

	<ul style="list-style-type: none"> • “Strong business input from a strategy and business process perspective.” • “Consider the impact of organisational maturity on what one is trying to accomplish.” • “Define the organisation from all perspectives – including business and IT.” • “Ensure that business drives EA and EA drives SOA.” • “Ensure that there clear and measurable value proposition to the business.” • “Communicate with terminology that the stakeholders understand.”
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The interviewees provided tangible guidelines that could be used for SOA and EA implementations. According to some of the interviewees, an EA and SOA reference guide was a useful method to have uniform communications, but they also highlighted that this need to be customised for the relevant audience. The maturity of the organisation also played a role in determining an integrated approach for SOA and EA, and it was also clear that organisations needed to define their problem very clearly in order to establish whether SOA, EA, or a combination of both would be the way to provide a solution to the business. In terms of the data received from the interviews, it seemed that as the organisations had matured in their practice of both SOA and EA, the integration of the two concepts became clearer and the value of following an integrated approach seemed to stand out much more.

Table 30 highlights Question 14 as well as a summary of the key themes in terms of the responses. The purpose of Question 14 was to gather an understanding of the business case elements that were important for EA and SOA implementations.

Table 30: Summary of Question and Responses for Question 14

Question	Summary of Key Theme from Respondents
<p>If you had to be involved in implementing both SOA and EA, what are the key aspects that you would document in your business case?</p>	<p><u>Interview Guide Key Theme:</u> Implementation</p> <ul style="list-style-type: none"> • “Flexibility and faster time to market.” • “Increased efficiencies and opportunity for reuse.” • “Organisational wide impact.” • “Enablement of business strategy and

	<p>organisational change.”</p> <ul style="list-style-type: none"> • “Never use the words SOA and EA, rather communicate in business language.” • “Deliver quick wins, to garner support and easier access to funding for the larger items.”
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From the interviews it was possible to derive that the interviewees had a number of business case items at the top of mind, highlighting the experience of the interviewees as they were very prescriptive in stating what the business case items need to be for SOA and EA. The first and most obvious aspect that needs to be noted from this question is that a business case must be produced for SOA and EA, and Table 30 highlights the themes that must be accounted for in a business case of this nature. The interviewees also stated that the business case is a very powerful tool that architects can use to drive the relationship between SOA and EA.

Section 3 of the interview guide focussed on the more practical aspects with regards to the relationship between SOA and EA, as well as how SOA can be used as an enabler for EA. The interviewees highlighted a number of key aspects such as ensuring organisational wide impact and delivering quick wins (refer to table 30 for full list) that need to be taken into account especially with regards to business case impact as well as the guidelines that should be looked at for SOA to enable EA.

Organisational maturity as well as alignment with business was also highlighted in this section, and it must be noted that there was a very strong business focus from all of the interviewees, suggesting that the maturity of the organisation was increasing especially when comparing current and previous implementations. The challenging nature of SOA and EA projects were also highlighted in the interviews and it was clear that many of the interviewees have learned from past experience, and could easily provide practical examples of guidelines to focus on.

4.5.4. Interview Questions Section 4

This section consists of four questions with the main objective of establishing the impact of organisational issues with regards to SOA and EA. The theme for Section 4 was defined as organisational considerations, and the main idea was to ensure that the interviewees could provide their insight in terms of whether organisational considerations impacted the relationship between SOA and EA. This section allowed me to gather data on the relationship between SOA and EA, from a people, and organisational culture perspective.

Table 31 highlights Question 15 as well as a summary of the key themes in terms of the responses. The purpose of Question 15 was to gather an understanding from an organisational culture or industry vertical perspective and what role, if any, these aspects played in terms of SOA and EA.

Table 31: Summary of Question and Responses for Question 15

Question	Summary of Key Theme from Respondents
<p>Do you consider organisational culture or industry to play a role in considering the implementation of SOA and EA?</p>	<p>Interview Guide Key Theme: Organisational Considerations</p> <ul style="list-style-type: none"> • “Industry vertical plays a role, as some industries can achieve more benefit from EA and SOA than others. Culture plays a role from an adoption perspective.” • “Innovative culture is great for EA and SOA but for many other things as well.” • “Culture must be conducive to change.” • “Industry vertical does not play any role.”

Organisational culture is defined as: “shared perceptions of organisational work practices within organisational units”(Van Den Berg & Celeste, 2004). The interviewees responded very openly to the question of culture and industry vertical, and this was especially relevant in this particular organisation, which was in business for more than a hundred years. There were strong views on whether culture played a role or not as well as vertical, however based on the analysis of the data, it was very clear that organisational culture and vertical did play a role. The aspect of culture was discussed both from a change adoption perspective and from an innovation perspective, where it was noted that these were key aspects that needed to be taken into account from a SOA and EA perspective. In terms of industry vertical, the interviewees did state that although this should not play a role in SOA and EA, it does due to nature of some of the verticals, such as financial services, which is much more established and difficult to change.

Table 32 highlights Question 16 as well as a summary of the key themes in terms of the responses. The purpose of Question 16 was to gather an understanding from an organisational culture or industry vertical perspective and what role, if any, these aspects played in terms of SOA and EA.

Table 32: Summary of Question and Responses for Question 16

Question	Summary of Key Theme from Respondents
<p>What type of organisational structure do you believe is necessary for SOA and EA?</p>	<p>Interview Guide Key Theme: Organisational Considerations</p> <ul style="list-style-type: none"> • “Structure is important in terms of where

	<p>EA and SOA are positioned as well as the reporting lines from a business perspective.”</p> <ul style="list-style-type: none"> • “There must be Board representation for the function, more especially in the case of EA.” • “Needs to be centralised functions supporting the entire organisation with links to specific departmental architects.” • “Structure needs to be flat and managed though performance.”
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The interviewees highlighted a few key aspects with regards to Question 16, but a key theme that was maintained across the interviewees was executive buy in and support for these initiatives. As documented in Table 32, some of the views were that there needs to be board representation for the function in order for these types of initiatives to succeed. There was also the need to remove departmental silos with regards to organisational structure, as many of the interviewees felt that this created a bottleneck in terms of collaboration and group initiative.

Table 33 highlights Question 17 as well as a summary of the key themes in terms of the responses. The purpose of Question 17 was to gather an understanding as to where the reporting line of SOA and EA should be.

Table 33: Summary of Question and Responses for Question 17

Question	Summary of Key Theme from Respondents
<p>Should SOA and EA report to the business or CIO? Why?</p>	<p><u>Interview Guide Key Theme:</u> Organisational Considerations</p> <ul style="list-style-type: none"> • “SOA and EA should report into the business, however if the reporting line is into the CIO, then that individual needs to be very strong, and have board support.” • “EA should report into the business and SOA into the CIO.” • “It depends on the organisational understanding of the role of the CIO, if the function has executive support then this if fine but if the function is just a

	supporting role – it will not have the buy-in for projects such as EA and SOA.”
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The interviewees highlighted two important aspects with regards to Question 17. The first was that most interviewees saw EA and SOA as business functions that needed to report in the business. There was debate around SOA but EA definitely needed to report into the business. The second aspect was that EA and SOA could report into the CIO, in the event that that individual had executive support and was tasked with driving business change.

Table 34 highlights Question 18 as well as a summary of the key themes in terms of the responses. The purpose of Question 18 was to gather an understanding as to SOA and EA functions should be part of the same department or not.

Table 34: Summary of Question and Responses for Question 18

Question	Summary of Key Theme from Respondents
<p>Should SOA and EA functions be part of the same department? Why?</p>	<p><u>Interview Guide Key Theme:</u> Organisational Considerations</p> <ul style="list-style-type: none"> • “They don’t have to be part of the same department but there needs to be clear processes for engagement, and clear deliverables between them.” • “EA should be in one department and SOA in another with clear processes and deliverables.” • “Should be the same department and the words SOA and EA should not be used in the titles.”

The majority of the interviewees highlighted the fact that these functions did not need to be in the same department, as long as there was overall governance from an executive level that guided these aspects, as well as clear engagement models, processes, and deliverables. Some of the interviewees felt that in order to have business and IT alignment it was important to have these functions in the same department to ensure that these projects can be closely managed.

Section 4 in the Interview Guide, dealt with SOA and EA from an organisational perspective taking into account structure as well as roles and responsibilities. SOA and EA are very people intensive in their nature due to the fact that these aspects are enabling strategic change, and I wanted to explore the views of the interviewees in this regard. The response as highlighted in the tables above clearly

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indicate the need to articulate roles and responsibilities, as well the need to have executive ownership from a business perspective for both EA and SOA.

4.5.5. Interview Questions Section 5

This section consists of one question with the main objective of establishing any other aspects that might be related to SOA and EA that the interviewer might not have covered. The theme for Section 5 was defined as general considerations, and the main idea was to ensure that the interviewees could provide their insight in terms of any other aspects that might not have been covered during the interview. This section allowed me to gather data on the relationship between SOA and EA outside of the scope of the interview.

Table 35 highlights Question 19 as well as a summary of the key themes in terms of the responses. The purpose of Question 19 was to allow the interviewees to highlight any other aspects that they felt relevant, which were not discussed in the interviews.

Table 35: Summary of Question and Responses for Question 19

Question	Summary of Key Theme from Respondents
<p>Are there any other aspects that you believe need to be considered when looking at the relationship between SOA and EA?</p>	<p>Interview Guide Key Themes: General Considerations</p> <ul style="list-style-type: none"> • “Potential to create a separate role for SOA within the organisation.” • “Business needs to drive these aspects – both SOA and EA and there needs to be a big awareness drive.”

There are two main items that were raised, one of them being the need to create a separate role for SOA within the organisation as opposed to simply adding it to other technical functions or roles. The second aspect that was highlighted by many of the interviewees was that of reiterating the business involvement in SOA and EA.

4.6. Guidelines to Consider in using a SOA approach in EA

The findings from the interviews provided key inputs for the guidelines that one needs to consider in using a SOA approach in EA. The overall findings based on all interviews were that there is definitely a relationship between SOA and EA, and many of the interviewees had very strong views in terms of how the relationship between SOA and EA should be viewed. There were also key general considerations that were discussed during the interviews, and even though a few were not related to the research topic, they provided insight from an overall perspective. Table 36 documents the

guidelines were derived from the case study and maps them back to the Interviewees in terms of their responses during the Interviews.

The guidelines produced are not ranked in order of importance, but rather aim to provide a holistic set of criteria with which to adapt within the context of an organisational EA and SOA initiative. The guidelines are also not prescriptive in nature and should be used as one of the inputs in guiding SOA and EA initiatives. The key aspects that the guidelines aim to highlight are the following:

- Organisations must define what SOA and EA means to them. This can be achieved by utilising the guidelines as catalyst to enable this discussion, based on the views provided by the guidelines.
- Organisations must understand the complementary nature of SOA and EA, if utilised correctly, as highlighted by the guidelines.
- Organisations must ensure that they communicate with the stakeholders in a way that is meaningful to them as highlighted by the guidelines.
- Organisations must understand the role of technology as an enabler for achieving the business objectives, and thus leverage it where necessary as highlighted by the guidelines.

Table 36 is discussed in more detail in the section that follows highlighting the methods used to derive the guidelines that are depicted below.

Table 36: Guidelines Derived From Interviews

Guidelines	Group SOA Architect	Employee Benefits Business Architect	Retail Business Architect	Group Business & Information Architect	Retail Chief Information Officer	Group Enterprise Architect	Group Solutions Architect	Group: Head of Technology Strategy and Planning
1. EA defines an organisation and SOA enables that through the definition of capabilities for the organisation that are re-usable, flexible and agile.	X	X	X	X	X	X	X	X
2. SOA can be considered both a business and technology concept. There needs to always be a link back to business that must be practically displayed whatever the context.		X	X	X	X	X		X
3. SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business by-in) in order to see real business benefit.	X	X	X	X	X	X	X	X
4. SOA and EA should not be seen / implemented in isolation to each other since they both have the same objective to deliver tangible value to the business.	X	X	X	X	X	X	X	X
5. Don't think about SOA as technology and rather think about it as a methodology for driving out capabilities.		X	X	X		X		
6. Use terminology that is relevant to the organisation that business understands and can relate to, even if it means not using the terms SOA and EA.	X	X	X	X	X	X	X	X
7. Ensure that the scope of EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with the sponsor along with the success criteria that the solutions will be measured against.	X	X	X	X	X	X	X	X

I analysed all of the responses provided by the interviewees and based on that formulated the guidelines as depicted in Table 36. Although, there was much documented in terms of the responses, it was imperative to ensure that the guidelines that were put forward in this section, provided some tangible recommendations to be used both in industry as well as the academic body of knowledge, and thus not all recommendations from the participants were documented as guidelines, however a summary of each of the participants responses were documented in section 4.4. The methodology used in determining the guidelines in Table 36 was to analyse all of the text and look for common themes throughout the responses. The common themes needed to be supported by majority of the Interviewees in order for them to be put forward as the final guidelines in the context of this research. Although some of the guidelines were not explicitly supported by all interviewees, there was no major disagreement and the majority of the opinions were similar throughout all of the interviews. The guidelines are discussed in more detail in Chapter 6.

Table 37 maps the guidelines that were derived to each of the interview questions to highlight the relationship between the guidelines and the questions that that were posed to the interviewees. Table 37 follows Table 36 due to the fact that the guidelines needed to be produced first before that could be related to the interview questions, in order to show how the interview guide was initially used as an input mechanism to produce the guidelines but also to show how the interview guide is also used as a correlation mechanism to highlight the relationship between the input areas (Interview guide) and the output of this research (Guidelines).

Table 37: Guidelines Derived From Interviews mapped back to Interview Questions

<u>Interview Questions</u>	Understand that EA defines an organisation and SOA enables that through the definition of capabilities for the organisation, that are reusable, flexible and agile.	Although SOA can be considered both a business and technology concept, there needs to always be a link back to business that must be practically displayed whatever the context.	SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business buy-in) in order to see real business benefit.	SOA and EA should not be seen / implemented in isolation to each other since they both have the same objective to deliver tangible value to the business.	Don't think about SOA as technology and rather think about it as a methodology for driving out capabilities.	Use terminology that is relevant to the organisation that business understands and can relate to even it means not using the terms SOA and EA.	Ensure that the scope of EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with the sponsor along with the success criteria that the solutions will be measured against.
1. What is your definition of EA?	X			X	X	X	X
2. What is your definition of SOA?		X	X	X	X	X	X
3. Do you consider SOA a business driver or technology driver? Why?	X	X	X	X	X	X	X
4.	X	X	X	X	X	X	X
5. Do you consider EA a technology driver or a business driver? Why?							
6. Are there any frameworks / industry practices or industry guidelines that you subscribe to with regards to SOA	X					X	X

and EA?											
7. Would you categorize SOA and EA to be business concepts or technology concepts? What is the motivation for your view?	X	X	X	X	X	X	X	X	X	X	X
8. Do you think that there is a relationship between SOA and EA? Please elaborate?	X	X	X	X	X	X	X	X	X	X	X
9. Do you think that there is a relationship between EA and business strategy? Please elaborate?	X	X	X	X	X	X	X	X	X	X	X
10. Do you think that there is a relationship between SOA and business strategy? Please elaborate?	X	X	X	X	X	X	X	X	X	X	X
11. Do you think that SOA can enable EA? What are the guidelines that you would follow to achieve this?	X	X	X	X	X	X	X	X	X	X	X
12. Briefly describe your understanding of the implementation of SOA and EA within this organisation?	X	X	X	X	X	X	X	X	X	X	X
13. Were these implemented as part of a programme or separately? Why? Do you think that these projects could have been related to each other and how?											X
14. What guidelines would you use to implement SOA and EA?	X	X	X	X	X	X	X	X	X	X	X
15. If you had to be involved in implementing both SOA and EA, what are the key aspects that you would document in your business case?	X	X	X	X	X	X	X	X	X	X	X

16. Do you consider organisational culture or industry to play a role in considering the implementation of SOA and EA?	X				X					X
17. What type of organisational structure do you believe is necessary for SOA and EA?										X
18. Should SOA and EA report to the business or CIO? Why?										X
19. Should SOA and EA functions be part of the same department? Why?										X
20. Are there any other aspects that you believe need to be considered when looking at the relationship between SOA and EA?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The Interviewee responses and the interview questions linked into the guidelines, highlighting interdependencies between the interview responses and the interview questions as well as the relationship to the outcome which are the guidelines depicted in Table 36 and Table 37. The interview questions played a vital role in determining the guidelines as this was the means with which to engage with the interviewees as well as understand other aspects that might have not been proposed as interview questions.

The overall purpose of Table 37 was to highlight the importance of the Interview guide in the context of this research, as well as outlining the relationship between the final guidelines and the questions that were posed to the Interviewees. It was evident during this process that final guidelines that were produced were directly linked to the Interview questions as highlighted by Table 37.

4.7. Summary

Chapter 4 documented the key findings from the interviews that were conducted as part of the case study within a financial services organisation in the Western Cape. The chapter first provide an overview of the research problem and questions that this research addressed. Section 4.2 highlighted the Interview participants, followed by the interview guide in section 4.3, which provided an overview of the process followed for each interview as well as the structure of each interview. Section 4.4 documented response for each of the questions that were asked within the interviews. Salient points from each response were captured and not the entire response for each question. In certain instances, where I found the response to be very valuable in terms of the content, more detail was provided. As mentioned in Chapter 3, full recordings of all the interviews are provided in Appendix A, on CD together with this thesis, for the interested reader to gain access to the more detailed responses. The last section, section 4.5 in this chapter provided the guidelines for SOA to enable EA, and finally the summary of the chapter.

5. Contribution

5.1. Introduction

This chapter focuses on a discussion of the findings presented in this thesis, and reflects the major contribution of this research. Section 5.2 delves into the detail of the final guidelines that were developed based on the literature study in Chapter 2 as well as the data collected from interviews presented and discussed in Chapter 4. Section 5.3 and 5.4 deal with the aspect of verification of the guidelines - firstly to demonstrate how the guidelines were validated in terms of a survey that was done, and secondly as a triangulation exercise with some input from myself (also see chapter 3.2 – Table 11, and 5.3.2 – page 98) from an industry experience perspective. Section 5.5 reflects on the study with reference to the literature study, research methodology, as well as the case study that was investigated, and finally section 5.6 provides a summary to the chapter. Figure 19 provides a graphical representation of the structure of Chapter 5.

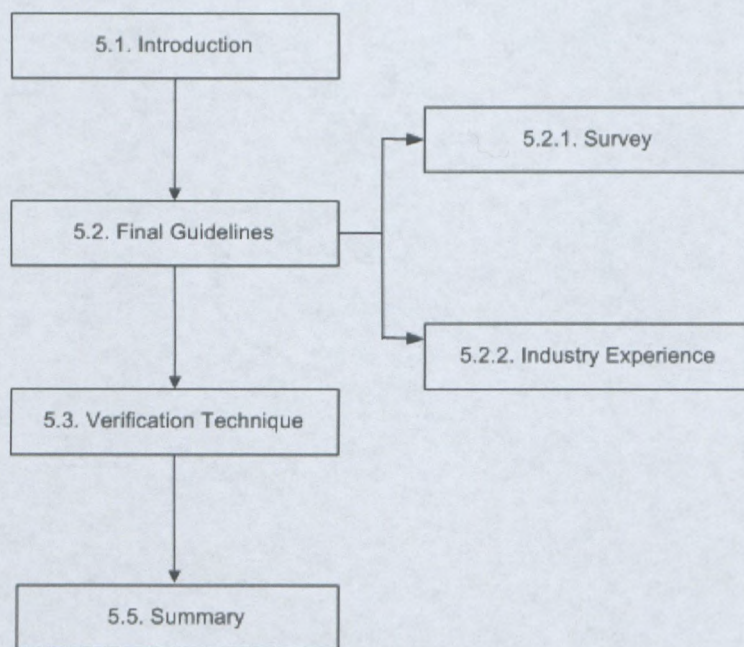


Figure 19: Graphical Representation of Chapter 5

5.2. Final Guidelines

The main research question for this study was: What are the guidelines for Service Oriented Architecture to enable Enterprise Architecture? In order to provide an answer to this question, I conducted a literature study as well as a case study to document practical guidelines as to how SOA can enable EA. As mentioned in chapter 3 (section 3.2.), I analysed the literature as well and conducted a case study in order to derive the guidelines. The first seven guidelines are derived from the case study (refer to chapter 4 for more details) and the last three guidelines are derived from the literature (refer to chapter 2 for more details). The outputs of the findings are documented as guidelines below:

1. *Understand that EA defines an organisation and SOA enables that through the definition of capabilities for the organisation, that are re-usable, flexible and agile.*
2. *Although SOA can be considered both a business and technology concept, there needs to always be a link back to business that must be practically displayed whatever the context.*
3. *SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business by-in) in order to see real business benefit.*
4. *SOA and EA should not be seen / implemented in isolation to each other since they both have the same objective to deliver tangible value to the business.*
5. *Don't think about SOA as technology and rather think about it as a methodology for driving out capabilities.*
6. *Use terminology that is relevant to the organisation that business understands and can relate to even it means not using the terms SOA and EA.*
7. *Ensure that the scope of EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with the sponsor along with the success criteria that the solutions will be measured against.*
8. *Define what architecture artefacts SOA will deliver as well as those that EA will deliver, to avoid duplication and ensure that these two disciplines complement each other, and most importantly that the links back to business are clearly articulated..*
9. *Roles and responsibilities need to be defined for both SOA roles and EA roles, so as to ensure that both teams are working towards the same objectives especially with regards to linking business and IT.*

10. Define what SOA and EA are specific to the organisation as well as what each will deliver to the organisation. This should be enshrined as a group wide business and IT principle against which SOA and EA endeavours are measured.

According to the research, the above guidelines should assist organisations in ensuring that the necessary checkpoints are available when they embark on a SOA and EA projects. During the interviews it was emphasized that both SOA and EA projects are very costly and that it is therefore necessary to ensure that organisations have some form of controls in place to verify that the funds they are allocating to EA and SOA projects are carefully allocated. The guidelines derived should provide some input into those controls, with the main objective of ensuring that SOA and EA projects deliver value to the business.

5.3. Verification Technique

The purpose of the verification technique (also see chapter 3 section 3.5.3) is to ensure that the findings of the research are validated or at least tested in some form or the other to ensure credibility both in the academic sphere and in the professional context. Section 5.3.1 presents the results of a short survey conducted as verification of the guideline, followed by section 5.3.2 where as a triangulation exercise some comments are made from an industry and practitioner perspective.

5.3.1. Survey

As mentioned in Chapter 3, Gable (1994:3), discusses survey as a means for quantitative analysis. This section documents the findings of the survey that was sent out to industry architects who practice both SOA and EA. The survey was sent out to 15 participants; however only 8 participants responded to the survey, and thus the results are a reflection of the responses received only. The detailed results can be viewed in Appendix C. This section provides a summary of the results in the context of each guideline, as well as some of the comments that were provided by the respondents. Microsoft Excel was used to analyse the data. I took all the responses received and counted the number of respondents that agreed, disagreed, and didn't know for each guideline. The summary of the responses received is provided in Table 37. A comments section was provided in the survey, wherein some of the participants provided some comments in terms of the guidelines. These can also be found in Appendix C.

Table 38: Summary of Interview Responses mapped to the Guidelines

	Agree	Disagree	Don't Know
Guideline 1	8	1	0
Guideline 2	8	1	0
Guideline 3	8	0	1
Guideline 4	7	2	0
Guideline 5	9	0	0

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Guideline 6	7	2	0
Guideline 7	9	0	0
Guideline 8	9	0	0
Guideline 9	9	0	0
Guideline 10	9	0	0

Table 37 summarises the responses received for each of the guidelines. The majority of the respondents surveyed supported the conclusions highlighted by this research, however as highlighted in Chapter 4, there were some participants that did not agree with some of the guidelines, and this was mainly due to their view as to whether SOA and EA were business or IT concepts (**see chapter 4 Table 22, p. 80**). The analysis of the results from the survey show that the participants support the guidelines that were derived from this study, and this provides a level of validation for the output of this study, especially from a practical perspective. There were only 9 respondents for the survey (even though it was sent out to 15 people), however the results need to be tested in a far wider audience in order to validate completely. The intention of this study was to validate in the context of the case study organisation only. The comments that were received as part of the survey, did also summarise the important aspect of business involvement and communication, which is supportive of the guidelines as well as the analysis provided in Chapter 2 and Chapter 4. The outcome of the survey was that there was no need to refine the guidelines due to the supporting responses received from the survey.

5.3.2. Industry Reflection

In my experience with both SOA and EA projects, I have found that the biggest issue that arises when dealing with these concepts is one of understanding. Having done implementations in three large corporate organisations both in the public and private sector, the key issue has always been that both SOA and EA have always had a focus in IT and very little in terms of business, and I believe this is mostly because architects haven't been able to clearly articulate the concepts in business language.

The relationship between SOA and EA has also been viewed from an IT perspective rather than looking at the value that these could add to business. The guidelines that were suggested in this research definitely addresses the key issue of ensuring understanding of the concepts in the context of the specific organisation as well as ensuring that both SOA and EA are driven from a business perspective. The issue of articulation has also been addresses through the guidelines, and one of the key messages identified is to limit the use of the word SOA and EA, and rather use business scenarios to motivate for these types of approaches.

Both the literature and the interviews clearly indicate that there is definitely a relationship between SOA and EA, but in order to capitalise on the benefits of that relationship, it is very clear that there

need to be some guidelines to facilitate these on a practical level. The guidelines that were documented in this chapter provide a mechanism for architects and organisations with a means to start their SOA and EA initiatives with some level of direction.

Another key aspect that was pertinent in this study is the aspect of roles and responsibilities. I have found in my experience especially with regards to SOA and EA, that unclear roles and responsibilities can be greatly detrimental to the project. Even if SOA and EA architects sit in different areas of the business they need to be driving the same objectives. Figure 20 highlights the fact that there are architecture decisions that need to be made at all levels of an organisation, and this needs to be clearly defined to ensure there is no confusion when decisions need to be made.

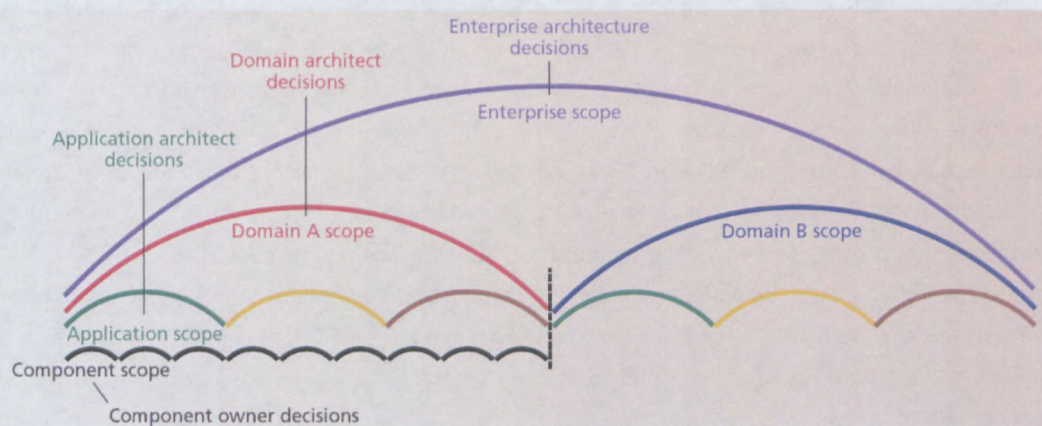


Figure 20: Architecture Levels of Scope (Malan & Bredemeyer, 2002)

The guidelines documented in this research highlight the roles and responsibilities for both EA and SOA and can be used to assist with unclear roles and responsibilities. These guidelines are generic and in a domain the team should look at the specific case and the guidelines need to be adapted to fit the specific case.

The most important aspect that organisations need to embrace is the fact that the relationship between SOA and EA can add value to an organisation in aligning business and IT to ensure value is provided to the customers. The guidelines and the research that has been conducted also support my experiences within the industry.

5.4. Summary

This chapter provided a discussion into the findings of this study, as well as reflected on the research methodology and data collection techniques that were used to elicit the data. The chapter began with the introduction providing an overview of the sections to follow. The next section focused on the most important aspect of this research, which was to determine the final guidelines for this study. Section

5.3 discussed the verification technique that was used to validate the results of this study. Section 5.4 provided a summary of the chapter.

6. Conclusion and Further Research

6.1. Introduction

The purpose of this study was to investigate the role that SOA plays as an enabler for EA. This study started by highlighting the findings of Linthicum (2008), where he stated that EA focuses on the crafting of a plan and SOA focuses on the implementation, once the planning has been done. I began by conducting a study of the literature to understand the relationship between SOA and EA. Based on the findings from the literature study I was able to put together preliminary guidelines for using a SOA approach in the implementation of EA. A similar exercise was carried out via a case study, and the combined findings were documented as guidelines for SOA to enable EA.

The results of this study have shown that addressing the relationship between SOA and EA within organisations should be beneficial to an organisation from many perspectives such as alignment of business and IT as well as creating more business value from the use of IT. This is supported by Linthicum (2007), where he highlights the following benefits that organisations can achieve from a business perspective if this relationship is addressed:

- Deliver the needed Enterprise Capabilities.
- Identify the potential investments required to build an SOA.
- Develop a Service Catalogue.
- Foster a collaborative reuse-oriented culture as a model for the rest of IT.
- Identify opportunities to externalize business services, as well as identify external services for consumption.
- Continue to measure agility and reuse, and adjust as needed.
- Monitor the integration with partners.
- Continue to monitor the value to business.

Figure 21 graphically represents the structure of this chapter.

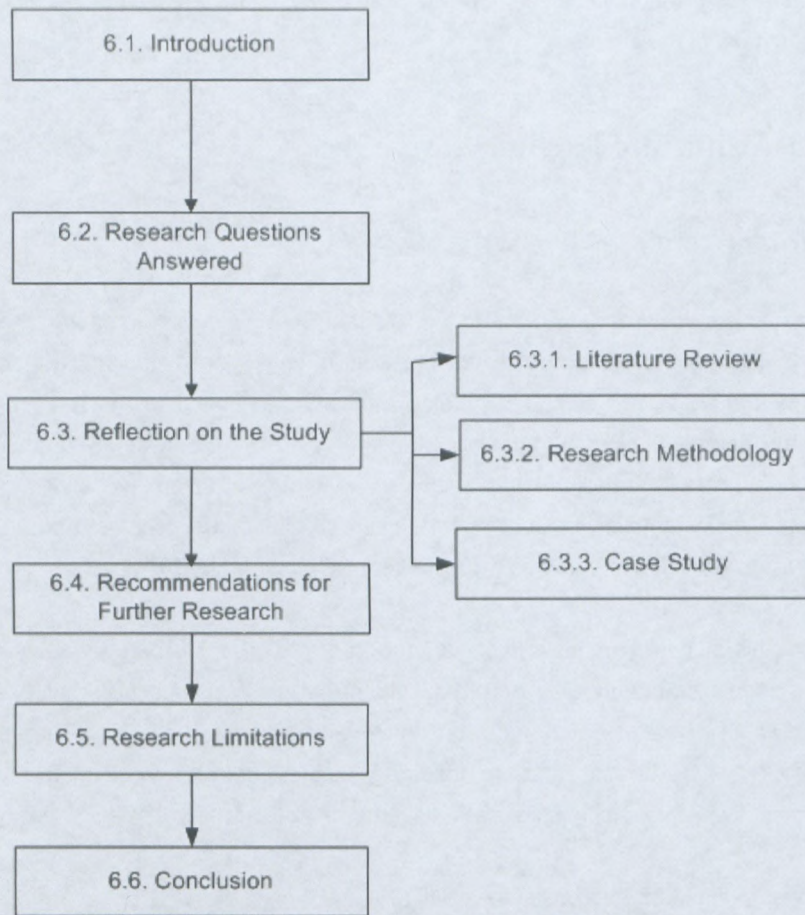


Figure 21: Graphical Representation of Chapter 6

As graphically depicted in Figure 21, section 6.1 provides an introduction to the chapter, thereafter section 6.2 summarize the study by answering the research questions, section 6.3 provides some recommendations for further research and finally section 6.4 provides a conclusion to the study.

6.2. Research Questions Answered

This study began with a focus on the following sub-questions as listed below:

- a) What is the relationship between SOA and EA?
- b) What are the guidelines for SOA to enable EA according to the literature?
- c) What are the guidelines for SOA to enable EA according to industry practitioners?

Sub-Question a – The relationship between SOA and EA is summarised as a means to align business and IT both from a business strategy and from a technology perspective. This sub-question is addressed in Chapter 2 and Chapter 4.

Sub-Question b, c – These sub-questions were addressed in Chapter 2 and Chapter 4. The guidelines mentioned were derived from both a literature review perspective as well as a case study perspective to propose a final set of guidelines. The final guidelines are presented in Chapter 5.

The research problem for this study, as stated in Chapter 1, was that there is the lack of guidelines for SOA to enable EA resulting in the misalignment of business and IT. I addressed this problem the research questions, and also by developing a set of guidelines as per the requirement of the problem. The main research question for this study was: **What are the guidelines for Service Oriented Architecture to enable Enterprise Architecture?** The process of determining answers for the sub-questions assisted me in providing an answer for the main research question by providing the guidelines as to how SOA can enable EA. The guidelines that were developed are displayed below, as per Chapter 5:

- *Understand that EA defines an organisation and SOA enables that through the definition of capabilities for the organisation, that are re-usable, flexible and agile.*
- *Although SOA can be considered both a business and technology concept, there needs to always be a link back to business that must be practically displayed whatever the context.*
- *SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business buy-in) in order to see real business benefit.*
- *SOA and EA should not be seen / implemented in isolation to each other since they both have the same objective to deliver tangible value to the business.*
- *Don't think about SOA as technology and rather think about it as a methodology for driving out capabilities.*
- *Use terminology that is relevant to the organisation that business understands and can relate to even it means not using the terms SOA and EA.*
- *Ensure that the scope of EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with the sponsor along with the success criteria that the solutions will be measured against.*
- *Define what architecture artefacts SOA will deliver as well as those that EA will deliver, to avoid duplication and ensure that these two disciplines complement each other, and most importantly that the links back to business are clearly articulated.*

- *Roles and responsibilities need to be defined for both SOA roles and EA roles, so as to ensure that both teams are working towards the same objectives especially with regards to linking business and IT.*
- *Define what SOA and EA are specific to the organisation as well as what each will deliver to the organisation. This should be enshrined as a group wide business and IT principle against which SOA and EA endeavours are measured.*

SOA can enable EA through the guidelines provided; however as highlighted in the data, this is only possible when there is strong business will and drives to achieve alignment between business and IT through this approach.

6.3. Reflection on the Study

This section reflects on the study in terms of the data that was collected both from a literature study perspective as well as from the case study. The section also reflects on the research methodology that was followed with reference to this research and how these aspects guided me in developing the final output.

6.3.1. Literature Review

Randolph (2009) states that the literature study highlights the researchers knowledge in terms of field of study with regards to many aspects including the current research that is available. In the context of this study, I used the literature study to demonstrate the material that is available with specific focus on the research problem as well as to provide answers to the research questions. The literature study began with an overview of EA, as well as the frameworks that are available for EA and benefits and shortfalls of those frameworks. The next section was an overview of SOA as well as the characteristics of SOA, and considerations that one needs to take into account when taking on a SOA implementation. The literature study then focused on the key aspect of the study, which is the relationship between SOA and EA, where I provided detail with regards how these concepts relate to each other as well as project considerations. The final aspect was determining the guidelines that one needs to follow in using a SOA approach in implementing EA, and thereafter a summary of the chapter.

In the previous sections the aim of the literature review was to find relevant guidelines from the current research that could be used by organisation from a practical perspective, and this was achieved during the process.

6.3.2. Research Methodology

The research methodology is important in any research endeavour as it provides a framework for the entire study as well as the process that the researcher will follow in providing answers to the research problem. In Chapter 3 the research methodology for this study was a qualitative inductive method, and this proved appropriate as this study required a great focus on the analysis of data as well as deriving the conclusions based on the data that was analysed. The conclusions that were derived formed the basis for the guidelines that were highlighted in the previous sections.

I also compared the underlying structure of the study to the characteristics of a qualitative study as proposed by Hoepfl (1997). This provided validation for the chosen methodology and ensured appropriate structure in the approach. Figure 22 graphically displays the process that was followed to determine the final guidelines for using a SOA approach in implementing EA.

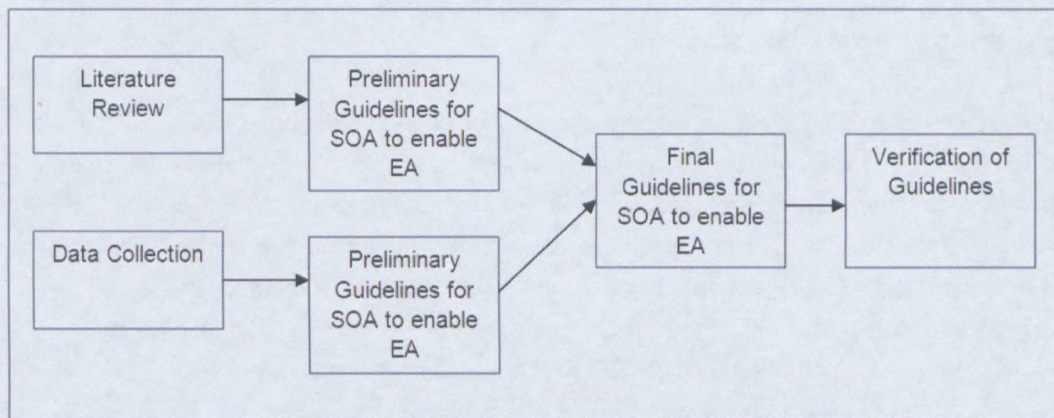


Figure 22: Approach for Determining Guidelines

The process that was followed involved conducting a literature study (Chapter 2) to determine the current research, as well as determine the guidelines that could be derived from the literature. The next step was to conduct a case study (Chapter 4), and through the process of analysing the data, derive appropriate guidelines for using SOA to enable EA. Finally, the combined guidelines based on those gathered from the literature and those gathered from the case study were put forward as final guidelines and ultimately the major contribution of this study.

The guidelines were validated through a survey that was sent out to industry architects and practitioners. The results of the survey are found in Chapter 5 where most of the architects and practitioners agreed with the set of guidelines. No additional guidelines were identified. In Chapter 5, I also reflected on the guidelines from my own industry and practitioner's experience. However, my input was in the format of a discussion and did not influence the set of guidelines identified.

6.3.3. Case Study

In order to investigate the relationship between SOA and EA, and more importantly determine how SOA enables EA, I decided to follow the route of investigating the research questions in the context of a real-life example, being a large financial services organisation in the Western Cape. In Chapter 3, Bolan and Mende (2004), provide support for this approach by stating that a case study is an investigation of a phenomenon within a real world context.

The organisation that was chosen provided me with appropriate means to fully investigate the research questions due to the fact that I was employed at the organisation during the time of the study. All of the selected participants were senior people in the organisation and many of them executives as well, and the interviews were only possible due to the level of trust that existed between me and the participants., The interviews (accessible in Appendix A) were transparent and the participants provided a great deal of information that allowed me to derive the guidelines, as documented in the previous sections.

A key element that contributed to the success of this study was that this organisation had experience with both SOA and EA, which provided an appropriate context for the research. Case studies are dependent on the full participation of the interviewees in order to elicit sufficient data with which to address the objective of a study. The case study proved to be an appropriate method for the collection of data; however the transparency of the interviewees assisted greatly as well.

The table below (Table 15 – repeated from Chapter 3), shows the interview guide for this study.

Table 15 Interview Guide (repeated from Chapter 3)

	Interview Question	Theme	Objective
Section 1	<ul style="list-style-type: none"> • What is your definition of EA? • What is your definition of SOA? • Do you consider SOA as a business driver or a technology driver? Why? • Do you consider EA a business driver or Technology Driver? Why? • Are there any frameworks / industry practices or industry guidelines that you subscribe to with regards to SOA and EA? 	Contextualisation and Needs analysis	Establish individual understanding of key concepts and the basis for this.

Section 2	<ul style="list-style-type: none"> • Would you categorize SOA and EA to be business concepts or technology concepts? What is the motivation for your view? • Do you think that there is a relationship between SOA and EA? Please elaborate? • Do you think that there is a relationship between EA and business strategy? Please elaborate? • Do you think that there is a relationship between SOA and business strategy? Please elaborate? • Do you think that SOA can enable EA? What are the guidelines that you would follow to achieve this? 	Technology, Strategy and Business Alignment	Identify the relationship between EA and SOA, as well as the relationship between SOA and business strategy and attempt to elicit guidelines for these in general?
Section 3	<ul style="list-style-type: none"> • Briefly describe your understanding of the implementation of SOA and EA within this organisation? • Were these implemented as part of a programme or separately? Why? Do you think that these projects could have been related to each other and how? • What guidelines would you use to implement SOA and EA? • If you had to be involved in implementing both SOA and EA, what are the key aspects that you would document in your business case? 	Implementation	Identify the relationship between EA and SOA from an implementation perspective within this specific organisation to identify any possible relationship between SOA and EA.
Section 4	<ul style="list-style-type: none"> • Do you consider organisational culture or industry to play a role in considering the implementation of SOA and EA? • What type of organisational structure do you believe is necessary for SOA and EA? • Should SOA and EA report to the business or CIO? Why? • Should SOA and EA functions be part of the same department? Why? 	Organisational considerations	Establish the impact of organisational issues with regards to SOA and EA.
Section 5	<ul style="list-style-type: none"> • Are there any other aspects that you believe need to be considered when looking at the relationship between SOA and EA? 	General Considerations	Establishing any other aspects that might be related to SOA and EA that the interviewer might have not asked.

In terms of the themes, highlighted in the guide, the interviews provided information, the details of which can be found in Chapter 4. However in summary it was noted that there is definitely a strong relationship between SOA and EA, and SOA can greatly assist in enabling EA.

The case study also provided me with guidelines as to how SOA can enable EA, and this detail is also captured in Chapter 4.

6.4. Recommendations for Further Research

The data collection was done in a single case study environment, which was appropriate in scope for the qualification, but in order to generalize the guidelines derived, the study should be repeated at different organizations within different industries.

The fields of EA and SOA are large, and in this study I was not able to delve into all of the detail around all the aspects of both areas. However based on the literature study as well as the case study the following are a list of future research that may be considered:

- A study into the mapping of these guidelines into an existing EA framework such as TOGAF. This could prove valuable in providing some view of the maturity of an organisation in the initial stages of their implementation, and could potentially form part of the preliminary stage of the TOGAF ADM.
- A study into the relationship between SOA and business strategy. During the interviews, it was clear that many of the participants had different views on this, and there was much discussion with regards to this particular question with was further compounded by the views regarding whether SOA was a business concept or technical concept.
- A study into whether the use of a SOA approach in implementing EA provides any financial benefit to an organisation compared with an organisation that does these projects isolation. This would be very useful especially in the context of a quantitative study, where statistics could be determined and used as motivation for organisations with their initial business cases.

In the context of the findings from this study, another area of future research will be to study the use of these guidelines within an organisation, to demonstrate whether they are practically viable as well as to determine what benefit, if any, is achieved. This could provide a means to determine improvement of the guidelines.

6.5. Research Limitations

This research endeavour was difficult in many aspects, however some of the more important limitations have been noted below:

- The findings cannot be generalised as this study was conducted in a specific industry. It would have been ideal to conduct multiple cases across multiple industries and then compare the results, to have a more comprehensive conclusion.
- The survey results, although valid for the purpose of this thesis, would have been much more useful in the context of multiple industries and many more participants.

6.6. Conclusion

In conclusion, this study has highlighted the relationship between SOA and EA, as well as how the embracing of this relationship could assist organisations in their endeavours with regards to SOA and EA from many perspectives, including financial, strategic alignment, as well as business value. The guidelines that were derived during this study are based on the input from the literature study and the case study analysis, highlighting some the pitfalls that currently exist within organisations today. However in order to generalize the results, more case studies are needed that confirm the guidelines found in this study. The areas highlighted in section 6.4 for further research have the potential to expand on the findings of this study and provide more avenues for SOA to enable EA. The guidelines derived from this study are relevant to the academic body of knowledge and industry practitioners' body of knowledge, as they provide a means to criticise or enhance the findings and also provide areas for further study in terms of the relationship between SOA and EA. The fact that seven of these guidelines are derived from the case study will provide some insight into how industry perceives the relationship between SOA and EA which could enhance the current studies in this field. In terms of the industry practitioners, these guidelines provide a starting point, which they can enhance based on their specific needs to ensure that the relationship between SOA and EA is addressed properly, but also to provide a means of alignment of business and IT.

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Appendix A

CD CONTENTS – Interviews are contained in the folder “Interview Recordings”

Appendix B

Email – Survey

Hi All,

Last year, I embarked on a study of the relationship between Services Oriented Architecture (SOA) and Enterprise Architecture (EA) as part of my master’s thesis. Some of you were directly involved, in this study and others also contributed indirectly. Based on all of the data I collected, I have put together a set of guidelines to be considered when looking at the relationship between SOA and EA, as well as how SOA can enable EA. Attached to this email, is a very short survey based on the guidelines that I have put together.

I would really appreciate your help in answering this survey. Please be as honest as possible and if you feel that the guidelines do not make sense, please make a note of that in the comments section. The survey is short and would only require about 10 minutes of your time,

NB: Please save the document as “yourname.doc” and send back to me once completed – e.g. chris.doc. Also please read the instructions carefully so as to assist you in completing the survey as quickly as possible.

I assure you that **no names** will be mentioned in the collation of the results, and all of your responses will remain highly confidential,

If possible, I would really appreciate it if you could respond by 20th April 2011, in order for me to collate the results as per the academic timelines.

Your assistance in this regard would be greatly appreciated.

Thanks and regards,

Chris.

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Appendix C

Marked as folder "Survey Results" on CD

Appendix D

Marked as folder "Mini Literature reviews" on CD

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