The Measurement of Enterprise Architecture to Add Value to Small and Medium Enterprises

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THE MEASUREMENT OF ENTERPRISE ARCHITECTURE TO ADD VALUE TO SMALL AND MEDIUM ENTERPRISES

By

Masood Ruyter

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Supervisor: Dr A C de la Harpe
Co-supervisor: Mr E van Blerk

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ABSTRACT

South Africa has a complex financial and retail service industry with high reliance on the use of IT systems to ensure effectiveness and maintainability. Decision making and improved outcomes may be done through an IT aligned enterprise architecture (EA) strategy. EA is a capability that contributes to the support and success of an organisations' IT. Organisations are currently using EA to better align IT and the business strategy which provides a comprehensive view of the IT system. Thus, EA is increasing in organisations yet the measurement and value of EA is limited to organisations and enterprise architects.

The discussions of the benefits and value of EA has been discussed for several years, however there are still no consensus about how the benefits and value of EA can be measured. The lack and clear understanding of the benefits and value of EA needs to consider different aspects of IT as well as the shareholders when measuring the benefits and value of EA to an organisation.

This research study provides insight to EA measurement for organisations and enterprise architects. Achieving alignment between business and IT through the use of EA is one of the major concerns for executive management, therefore the benefits and value of EA needs to be measured and determined for current and future business decisions.

This research study provides a theoretical framework as a BSC/EA measurement scorecard for organisations and enterprise architects. Through the use of the BSC/EA measurement scorecard provided in this research study, organisations are able to determine the benefits and value of an EA strategy/framework or methodology. The theoretical BSC/EA measurement scorecard led me to define guidelines for enterprise architects/organisations who desires to implement an EA strategy or for enterprise architects/organisations who have already initiated their EA strategy.

Key findings for this research study conclude that EA measurement is of vital importance for day-to-day operations and future decisions.

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- To Riyaaz, my brother, for his motivation. Your motivation has inspired me.
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DEDICATION

- To my Mom and Dad. You are my motivation.

- To my Wife. You are my inspiration.

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GLOSSARY

ADM -	Architecture Development Method
ACF -	Architecture Content Framework
BB -	Business Benefits
BP -	Business Plan
BS -	Business Strategy
BV -	Business Vision
BSC -	Balanced Scorecard
CMM -	Capability Maturity Model
CMMI -	Capability Maturity Model Integration
EA -	Enterprise Architecture
E2A -	Extended Enterprise Architecture Framework
GEAP -	Gartner Enterprise Architecture Process
IS -	Information Systems
IT -	Information Technology
TOGAF -	The Open Group Architecture Framework

Chapter 1: Introduction

1.1 Introduction

Enterprise architecture (EA) is a comprehensive plan of the organisation; a plan which is used to collect aspects of business planning, such as: vision, strategies, goals and governance principles. EA assists in collaborating business operations, aspects of automation and enabling technological infrastructures. EA acts as a long-term view of an organisations processes, systems and technologies. Furthermore EA provides a method for organisations to communicate important elements within the organisation (Schekkerman, 2004:13). Ross, Weill and Robertson (2006:47) explain EA as the logic for business processes and IT infrastructure indicating integration and standardisation. The importance of EA is to identify the processes, data, technology and customer interface for execution of the EA strategy. Lankhorst (2009:317) identifies EA as a holistic approach which can be used to manage an organisations operation. EA is the design of an organisation, meeting various design requirements, such as: Systems, products, processes and applications. This needs to be looked at from a business and technical perspective. Goikoetxea (2007:446) defines EA to be a set of business and engineering artifacts which describes the enterprise wide system, such as: the life-cycle, evolution, management and maintenance.

These artifacts include the following:

- Vision statement
- System requirements
- Business process architectural view
- Business systems architectural view
- Data architectural view
- Application architectural view
- Technology architectural view

EA is also known as a set of descriptions which provide indicators allowing evolution and success within organisations (Land, Proper, Waage, Cloo & Steghuis, 2009). Zachman (1996:5) describes architecture to be a set of design artifacts that are capable of describing an object in order to produce its requirements and at the same time he explains EA to be a model which is useful for describing an organisation to produce value to management.

The purpose of this research study is to identify the complexity of EA measurement and to provide possible measurement guidelines for an organisation.

Diagram 1 depicts the structure of Chapter 1.

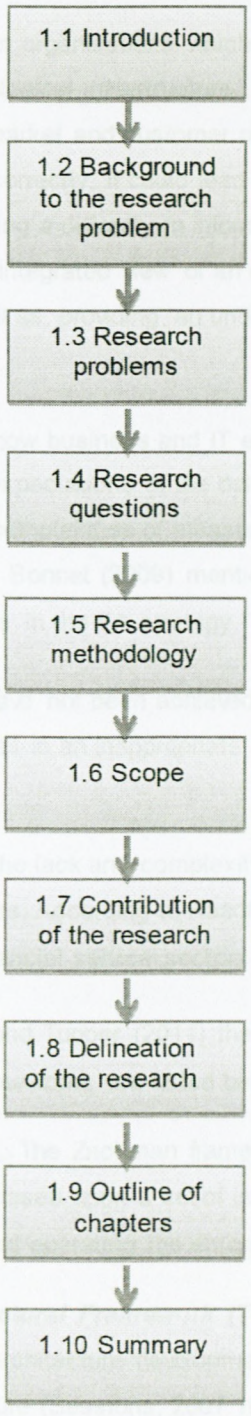


Diagram 1: Representation of Chapter 1.

1.2 Background to research problem

EA is known as the discipline within organisations which is involved with organisational processes, information distribution and technological infrastructure. The organisation needs to be able to continuously meet the change in market and customer needs. If the customer requirements and the change in market are managed incorrectly, it could lead to organisational complexity in the information systems portfolio causing a difficulty in information reliability and information sharing (Grigouriu, 2007). EA provides an integrated view of an organisation taking into consideration all aspects of the organisation, as well as, providing an understanding of strategic choices (Ross et al. 2006).

Bytheway (2004:8) clearly shows how business and IT employees can communicate with each other, but still have completely different expectations of the delivery of business needs. Bytheway (2004:106) further introduces the complexities of measurement of business benefits and the value created by Information technology. Bonnet (2009) mentions that minimal guidance has been given to EA measurement causing downfalls in the EA strategy. The most common downfalls are due to:

- EA goals and objectives have not been achieved.
- EA implementation partakes in an inappropriate manner which disallows evolution of the EA strategy.

These following factors relates to the lack and complexity of EA measurement to guide the EA strategy in order to achieve success. According to Raadt (2011) EA frameworks and strategies have not reached its level maturity in financial service sectors causing an ineffective EA strategy.

As described by Sessions (2007) and Tupper (2011) there are many EA frameworks on the market, however the most common EA frameworks are listed below:

1. ***The Zachman framework:*** The Zachman framework is not a methodology however it is an ontology. The ontology is based upon a set of important components of an object which is necessary for designing and operating the enterprise (Zachman, 2012).

2. ***The Open Group Architectural Framework (TOGAF):*** TOGAF is known as a framework which is significant for its architecture development method (ADM). The ADM is a method used for creating architecture (Sessions, 2007:16). According to The Open Group (2007) TOGAF is an architecture framework which is used to design and build an appropriate architectural framework for an organisation. The main aspect of TOGAF is the ADM which defines business needs and develops an architectural framework accordingly to those needs using elements within the TOGAF framework.

3. ***Gartner:*** Gartner is known as an EA practice (Sessions, 2007:29). Gartner revolves around aligning business owners, information specialists and technology implementers. If these three groups can be unified into a vision to drive business value, Gartner would be regarded as a success. Success is measured in reality metrics, such as profitability (Tupper, 2011:38).

From the above research found in literature, EA lacks measurement and benefit realisation strategies. Thus, EA frameworks are in need of a measurement strategy to constantly measure the success of an EA strategy.

1.3 Research problem

The research problem investigated for this research study is as a result of the lack and complexity found in EA measurement and benefit realisation. Organisations are therefore unable to determine the value which the EA provides to an organisation. Although EA has been a popular topic, minimal research has been done on EA measurement in organisations. The problem statement is as follows:

Problem statement

It is unclear how organisations that have implemented EA strategies, frameworks or methodologies measure the benefits and value of EA.

1.4 Research questions

The research questions are listed below:

Research Question – 1: What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?

SRQ - 1.1: What are the factors which could influence the measuring of implementation and development within EA?

SRQ - 1.2: What measurement methodologies are being used for EA within organisations?

SRQ – 1.3: How can EA measurement assist an organisation in optimising its business value?

SRQ - 1.4: What are the relationships between the EA levels of maturity and the measurement of EA?

As mentioned in the research problem, there is a lack in EA measurement, thus leading to the objectives and research questions. The objectives for this research study were as follows:

- Investigate EA implementation and development.
- Develop an EA measurement scorecard for organisations.
- Develop guidelines for enterprise architects from literature and industry.

1.5 Research methodology

The research methodology outlines the method in which data is collected. The research methodology starts off with the research philosophy whereby Bryman and Bell (2007:18) relate to the research philosophy as the way in which data should be collected and analysed. As described by Saunders, Lewis and Thornhill (2009:109) the research philosophy is affected by the ontology and epistemology. The ontology for this research is be based upon subjectivism as the study considers views and opinions of social actors (Saunders et al. 2009:111). An interpretivist stance has been selected as the epistemology position which supports the need to explore and understand the measurement and effectiveness of EA within South African organisations. This appears to be appropriate for assessing the measurement and effectiveness of EA within organisations, as the participants have their own set of meanings, where there might be several stories and conflicting descriptions.

Interpretivism which is a subjective approach in this study as opposed to positivism takes the stance that there is no reality of EA measurement as such, rather it is something which people practice by their own interpretation of reality (Bryman & Bell, 2007; Denzin & Lincoln, 2007; Thomas, 2009).

The research approach is inductive and qualitative research has been done. The qualitative inductive approach concentrates on understanding how people perceive a situation and determines meaning from the data which emphasises on theory development (Babbie, 2009; Bryman, 2012; Zikmund, Babin, Carr & Griffin, 2012).

The research strategy aids in achieving research objectives (See Section **1.4**) (Marshell & Rossman, 2011:94). The research strategies used for this study are based upon:

- Literature review
- Interviews
- Surveys

Marshell and Rossman (2011) state that the literature review substantiates the motivation behind a specific research area. The literature review gave the researcher an understanding of the aspects involved in EA implementation and development, EA maturity and EA measurement in order to derive suitable guidelines for enterprise architects.

Below is the list of the important keywords which were used to review the literature:

- EA implementation and development
- EA measurement
- EA maturity
- EA effectiveness
- EA life cycle

Interviews allowed the researcher to gain an understanding of EA from EA experts in industry. Through the use of interviews a researcher can gain direct observations from participants who are being interviewed (Kvale & Brinkman, 2009). Lastly surveys had been conducted. The purpose of the survey was to collect information pertaining to EA from several participants (Neuman, 2006:276). According to Zikmund et al. (2012:118) unit of analysis defines what or who should provide data.

The data was collected from in-depth interviews, surveys and literature. Themes were developed from common views, words and phrases, whilst the data analysis assured that the data collection was aimed at extracting specific needs for this research study. **Figure 1** presents the research strategy in collaboration with the data collection.

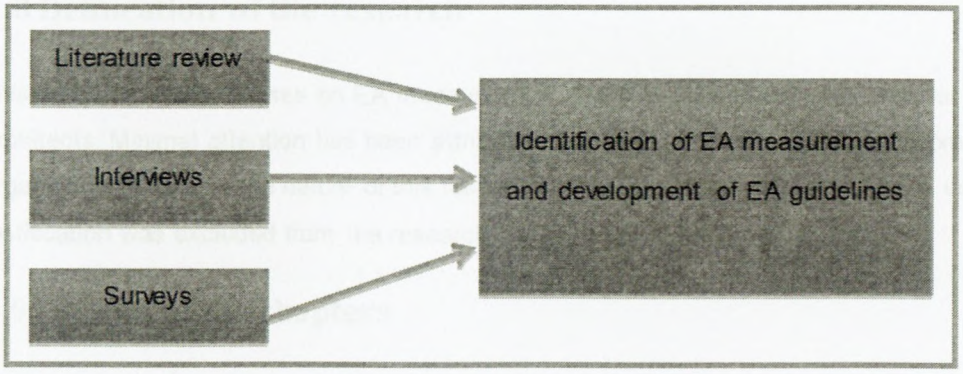


Figure 1: Representation of the research strategy and data collection

The purpose of **Figure 1** is to illustrate that the EA measurement strategies and EA guidelines were derived through the use of literature, interviews and surveys.

1.6 Scope

The scope of this research includes:

- EA frameworks (an overview of the frameworks have been presented only, as it was not essential for this research study to provide an in-depth explanation of each framework).
- EA implementation and development.
- The value of EA to an organisation.
- EA maturity.
- EA measurement strategies.

This research study focuses on EA measurement and guidelines for enterprise architects.

1.7 Contribution of research

This research study will provide enterprise architects with an understanding of EA measurement as well as set of guidelines for EA measurement. Through the use of these guidelines, enterprise architects can implement and develop an effective EA strategy.

1.8 Delineation of the research

This research study focuses on EA measurement and establishing EA guidelines for enterprise architects. Minimal attention has been attributed to EA frameworks and EA development in organisations. Due to the nature of this research study, case studies had not been used. EA cost-justification was excluded from the research.

1.9 Outline of the chapters

The research study is based upon six chapters. **Figure 2** is a representation of the research study as well as key points relating to each chapter.

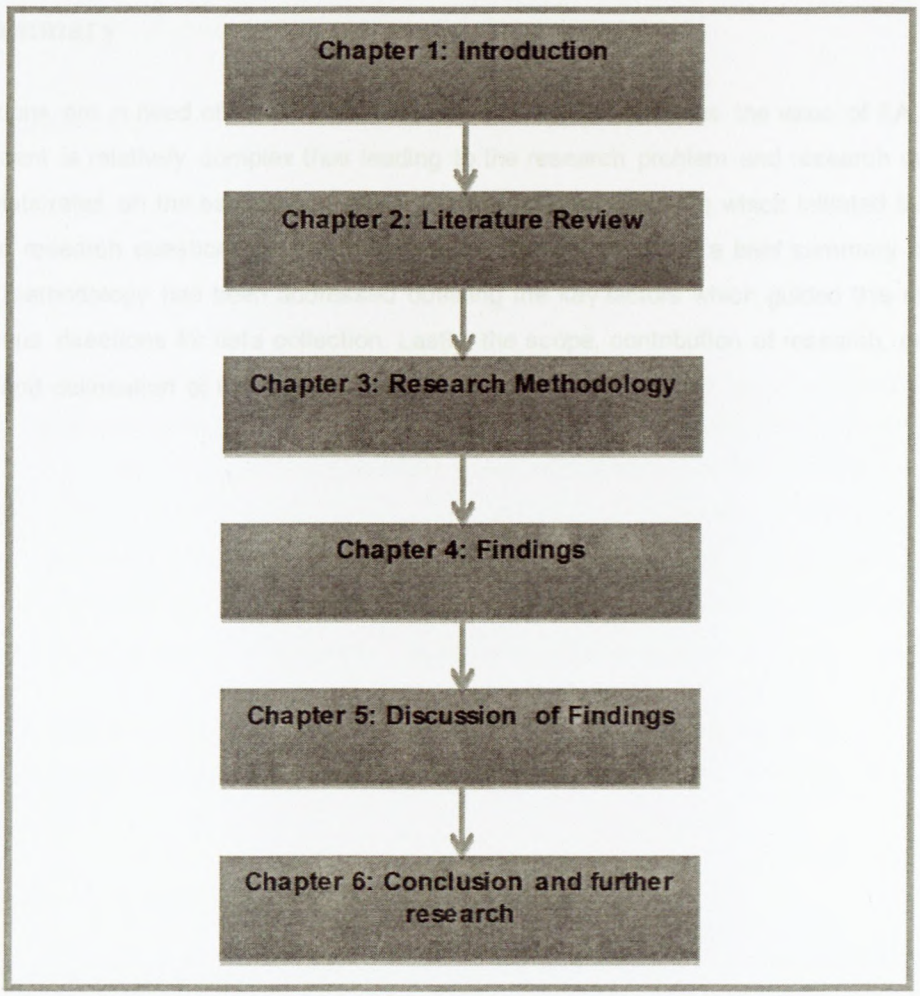


Figure 2: Representation of the research study chapters.

Chapter 1: The research scope, research questions and research methodology are formulated.

Chapter 2: In this chapter an overview of EA is presented, elaborating on all aspects involved in EA implementation and development, EA maturity and EA measurement.

Chapter 3: The research methodology describes the way in which the researcher went about gathering data for this research study.

Chapter 4: The findings from industry which were conducted through interviews and surveys are described and explained.

Chapter 5: A detail discussion of the findings which were derived in Chapter 4 in collaboration with the literature which has been collected in Chapter 2.

Chapter 6: Conclusions based upon the research study and recommendations for further research will be discussed.

1.10 Summary

Organisations are in need of an EA measurement strategy to determine the value of EA, though EA measurement is relatively complex thus leading to the research problem and research questions. This chapter elaborates on the background of EA and the research problem which initiated this research study. The research questions guided this research study. Thereafter, a brief summary of the research methodology had been addressed outlining the key factors which guided this research study in the various directions for data collection. Lastly, the scope, contribution of research, outline of chapters and delineation of the research has been addressed.

Chapter 2: Literature review

2.1 Introduction

The literature review covered EA in general and EA measurement. The objective of the literature review supports the research questions in an attempt to understand the complexities involved in EA measurement.

EA can be defined as a set of business functions and assets which assists in achieving business objectives (Zachman, 1996:7). According to Raadt (2011:29) EA is about understanding various elements and how they relate with one another. Every organisation has EA, whether it is simple or complicated, it exists within the organisation. The seminal work of Zachman (1987), addresses information system complexity by developing an architectural framework to define and control the interfaces and components of the information system. Schekkerman (2006) defines EA as the blueprint of an organisation. EA is therefore used as a guideline to achieve organisational objectives.

Minimal work has been done on EA measurement, more specifically the value which EA measurement offers an organisation after implementation. This research study will elaborate on EA measurement.

Chapter 2 covers the following topics:

- Enterprise Architecture
- Basic EA concepts
- Importance of EA concepts
- Selecting an EA framework
- Comparisons of EA frameworks
- EA maturity
- EA measurement

Diagram 2 depicts the structure of Chapter 2.

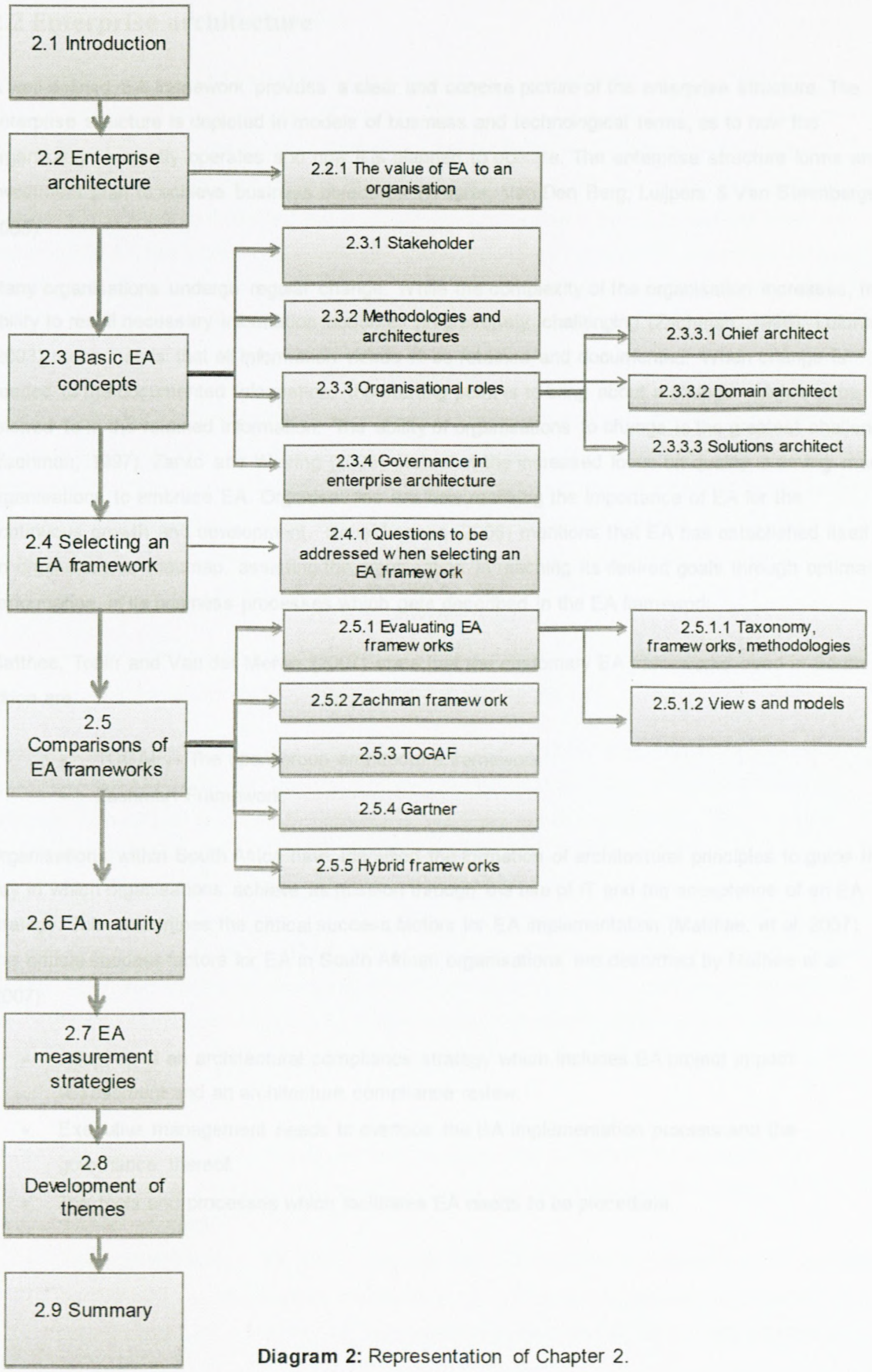


Diagram 2: Representation of Chapter 2.

2.2 Enterprise architecture

A well-defined EA framework provides a clear and concise picture of the enterprise structure. The enterprise structure is depicted in models of business and technological terms, as to how the organisation currently operates and how it is planned to operate. The enterprise structure forms an investment plan to achieve business objectives (Wagter, Van Den Berg, Luijpers & Van Steenbergen, 2005).

Many organisations undergo regular change. While the complexity of the organisation increases, the ability to recall necessary information becomes progressively challenging (Zachman, 1996). Luftman (2003) recommends that all information needs to be retained and documented. When change is needed to the documented information, the starting point is to bring about a change which can be referred to in the retained information. The ability of organisations to change is the greatest challenge (Zachman, 1997). Zarvic and Wiering (2006) state that the increased focus on quality is driving many organisations to embrace EA. Organisations are now realising the importance of EA for the continuous growth and development. Schekkerman (2006) mentions that EA has established itself as an organisational roadmap, assisting the organisation in reaching its desired goals through optimal performance of its business processes which gets described in the EA framework.

Matthee, Tobin and Van der Merwe (2007) state that the customary EA frameworks used in South Africa are:

- TOGAF – The open group architecture framework
- Zachman Framework

Organisations within South Africa have identified the formation of architectural principles to guide the way in which organisations achieve its mission through the use of IT and the acceptance of an EA strategy. This determines the critical success factors for EA implementation (Matthee, et al. 2007). The critical success factors for EA in South African organisations are described by Mathee et al. (2007):

- Adoption of an architectural compliance strategy which includes EA project impact assessment and an architecture compliance review.
- Executive management needs to overlook the EA implementation process and the governance thereof.
- The tools and processes which facilitates EA needs to be procedural.

2.2.1 The value of EA to an organisation

The significance of EA has become the basic ideology of IT management thus the effectiveness of EA is being recognised by organisations (Chorafas, 2002). CEOs, CIOs and management are beginning to understand that the correct use of information and strategies in IT is important for achieving business advantage and business success (The Open Group, 2009). The competitive advantage achieved with IT can be sustained and amplified through the use of EA. Organisations who have implemented EA has a greater foundation for execution as they already have embedded technology in their processes allowing them to efficiently mobilise the core operations of their organisation. EA provides a strategic solution for IT systems in response to the continuous changing needs in business environments (Ross et al. 2006).

While the lifecycle of specific applications and infrastructural components are becoming smaller, EA becomes more significant as a crucial component for strategic alignment. Failure to accomplish this would result in the creation of legacy systems which may place a drag on an organisations resource (Varghese & Kurien, 2004). Van der Klashorst (2001) mentioned that accurate planning and implementing of IT resources are considered to be successful in organisations. The major focuses on EA in organisations are due to:

- e-Business which propels the need for fast, effective and simple information exchange.
- Interoperability which propels innovation and investment.

Through the use of operative implementation, organisations can become more IT efficient as it reduces software development and maintenance cost (Ross et al. 2006). This can be linked to improved portability of applications, simpler systems and network management, improving and exchanging of components without affecting its flexibility to focus on organisational issues such as: security and reliability (The Open Group, 2009).

EA offers many benefits which includes a closer alignment of the entire organisation with the business strategy. This can be achieved through EAs ability to decompose known business strategies and processes into a language which can be understood by IT resources, thus allowing IT investments to be facilitated (Ross et al. 2006). Grigoriu (2007) has classified the value of EA into four categories, namely:

- *Governance benefits* – EA can be used as a roadmap to improve the structure and governance of an organisation by aligning roles and responsibilities and setting priorities for decision making.
- *Operational benefits* – EA guides improvements in maintainability, operability and operational performance. EA also reduces the overall product development lifecycle as it provides organisations with a standard interface enabling quicker design and solution selections.

- *Strategic benefits* – EA improves the flow and replication of data. EA should be developed beforehand to reduce costs of various implementation features and interfaces. The capability maturity model (CMM) capabilities can be achieved by documenting and measuring the EA process.
- *Communication, collaboration and compliance benefits* – EA can be used as a communication tool in organisations providing stakeholders and partners with information, thus improving the communication between the EA program and stakeholders.

The ASUG international survey held in 2010 published the following findings based upon EA values in organisations (ASUG, 2010). The top challenges which organisations faced were:

- Lack of enterprise architecture and understanding EA best practices.
- Lack of business buy-in to support the EA strategy.
- Lack of EA business case and extensive planning to sell EA to IT.

The business case needs to be included into every aspect of EA. By doing this, the business case articulates sufficient benefits to the organisation, thus allowing a greater amount of business buy-in and support towards the EA program (Grigoriu, 2007). Townson (2011) mentioned that organisations are not realising the benefits and value of EA. The difficulty adapts from enterprise architects being unable to measure the value and effectiveness of EA to an organisation.

2.2.1.1 EA alignment

The alignment of business and IT has been a major challenge for many organisations as the process happens to be intricate, due to IT systems being inflexible. Business alignment determines how the IT resources would support their business functions. Organisations are becoming more complex causing an inability to adapt to changes and as a result, organisations are struggling to link technology capabilities to the mission and vision of an organisation. Through the use of EA organisations are able to improve their IT related resources in order to achieve organisational needs (Lankhorst, 2009; Boucharas, Steenberg, Jansen & Brinkkemper. 2010).

EA assists in the alignment of business and IT objectives as well as presenting the current and future state of an organisations information system to the various stakeholders. Organisations usually perform gap analysis allowing them to identify what new resources need to occur in order to support their current and future state (Schekkerman, 2004; Tupper, 2011; Bernard, 2012).

2.2.1.2 An EA view

The use of EA frameworks in organisations helps to improve business and IT alignment. Majority of EA frameworks are used to outline a method to determine business objectives, however there is no universal standard for EA frameworks. Applying an EA strategy would allow an organisation to have internal consistent terminology and modeling methods. Through the use of modeling methods,

organisations can improve their architectural communication both inside and outside of IT. One of the main characteristics of EA modeling is its ability to account for multiple stakeholder views (Jonkers, Lanckhorst, Van Buuren, Hoppenbrouwers, Bonsangue, & Van de Torre, 2004).

Majority of IT systems have been ruled by their own management technique, resulting in organisations having IT systems which were unreliable and imprecise with no benefits to the organisation (Sanz & Glissman, 2011). The benefits of an EA framework is clear to an organisation, however there might be a gap in understanding the value which EA provides once implemented (Sessions, 2007).

2.3 Basic EA concepts

EA is been viewed as a top-down process, causing it to rely on basic EA concepts. The terminology of the concepts may vary from one EA framework to another. Below are the some of the EA concepts.

2.3.1 Stakeholder

This definition of a stakeholder is an individual who have responsibilities and interest in the results of the EA efforts. Majority of EA frameworks categorises a stakeholder built on his/her roles within the organisation. This is to outline the various groups of individuals rather than emphasising on the similarities between the groups. The groups are therefore entitled to establish the deliverables and information needed to complete their designated roles (Raadt, Schouten & Vliet, 2008).

EA requires an adequate amount of communication, cooperation and input from stakeholders within all areas of business. Preserving the information and needs of stakeholders are critical in managing the EA process as this allows the process to operate smoothly and effectively. (Tupper, 2011)

2.3.2 Methodologies and architectures

A methodology within IT refers to a process which can be executed in order to achieve an anticipated result. Methodologies are used to achieve specific business requirements (Tupper, 2011). Architecture is a comprehensive plan of the system components level to guide its implementation (Chorafas, 2002).

Architecture would be referred to implementation of EA within a particular field. Architectures have been developed for the technical specifications within an organisation in agreement with the business goals. Architecture needs to be scoped in an appropriate manner in order for goals to be communicated. This is required at the initial stages of the EA program.

The architecture phase needs to include:

- Scope of the EA program
- Attaining executive support and sponsorship
- Performing stakeholder analysis
- Establishing roles and responsibilities within the EA team
- Developing a communication and governance plan
- Defining success measures (Bittler & Kriezman, 2005).

2.3.3 Organisational roles

The partial success of EA depends on the EA team. EA teams differ from organisation-to-organisation. There a few main individuals who are responsible for EA within an organisation. These roles are discussed below:

2.3.3.1 Chief Architect

The chief architect is known as the leader of the entire EA program. He/she has the responsibility of establishing a strategy, guidance and a method for the EA program. The chief architect reports to executive management within the organisation; however the chief architect needs to understand the business strategy in order to develop and maintain an effective EA. Once EA has been defined and the initial start is in place, the chief architect needs to identify the possible changes within the organisation and allow for adjustments to the EA program (Strano & Rehmani, 2007; Bernard, 2012).

2.3.3.2 Domain Architect

The domain architect supervises individual architectures. The domain architect needs to maintain expertise within their specific domain. More prominently, the domain architect needs to understand the trade-offs which are involved in the selections of their choices and relate them to the business strategy. The domain architect would have minor architects working under them to undertake some of the work as he/she needs to report to the chief architect (Ahlemann, Stettiner, Messerschmidt, & Legner, 2012).

2.3.3.3 Solutions Architect

The solution architect persuades all of the architectures to implement a system and solve organisational problems. The solution architect is however not as knowledgeable as the domain architect as he/she is only used for the development of systems for implementation. The solution architect works in conjunction with the domain architect (Land et al. 2009; Greefhorst & Proper 2011).

2.3.4 Governance in Enterprise Architecture

EA is the complete master plan of an enterprise which works in association with business goals, vision, strategies and governance principles. EA can be of no use to an organisation unless it follows and implements accordingly to the governance (Schekkerman, 2004).

The procedure for managing governance differs from organisations and frameworks therefore a review process is usually done to accomplish a standard for the organisation. Majority of organisations necessitates EA compliance reviews before an IT project is approved. The reviews would identify and resolve architectural dilemmas before they become a problem. Many organisations have created EA repositories to produce a simpler governance process. The EA repositories allow project planners to use the repository to retrieve materials which can be documented within the architecture. Project managers can use the information to design the strategy in correspondence with the specifications which had been laid out by the architecture. Governance of information is usually done by the stakeholders of an organisation which allows information to be available to various viewers. The repository will also contain information required for compliance reviews making the repository a critical aspect of an EA endeavor in being more practical and beneficial to the organisation (Ahlemann at al., 2012; Bernard, 2012).

2.4 Selecting an EA Framework

An organisation can strengthen and increase the effectiveness of their endeavors by selecting the most appropriate EA framework to suite their organisation (Grigouriu, 2007).

There are numerous questions which organisations need to answer before initiating the EA strategy.

2.4.1 Questions to be addressed when selecting an EA Framework

The questions to be asked before selecting an EA framework are as follows:

- *Where does the organisation currently stand in terms of its IT resources?*
- *Organisations need to know whether or not they looking for a framework or methodology?*

2.4.1.1 Framework or Methodology

Sessions (2006:27) describes an EA framework to be a methodology for creating enterprise architecture in organisations. A framework would be suitable for an organisation that plans on building an EA program. The EA framework needs to follow a specific method. A methodology provides methods for developing architecture and is valuable for providing guidance. A methodology should only be seen as a comprehensive set of instructions (Sessions, 2007).

2.4.1.2 Standardisation

Once the framework or methodology has been decided upon, organisations are able to standardise processes depending on organisational needs. Organisations can either generate internal or external standards. The architectural standards are developed with an understanding of the business goals which are designed to ensure that all IT resources support their desired business goals. In addition to supporting business goals, architecture standards will also guide IT resources in becoming more agile (Grigoriu 2007; Lankhorst, 2009).

The best time to partake in the standardisation process is during the initial stages of the EA strategy. This approach grants the organisation to focus on a narrow field which is expected to bring about maximum return on the EA strategy. Standardisation can increase as the EA strategy becomes more mature. An increase in EA maturity assists the identification of effective standards which gets processed throughout the organisation (Ross et al. 2006; Boucharas et al. 2010).

2.4.2.1 The scope of EA

The most important aspect in EA is defining the scope of the project. When initiating an EA strategy, it is essential that the organisation decides upon the boundaries of the EA strategy (Ross et al. 2006). When defining the scope of EA, a team needs to describe the enterprise and determine how much of the enterprise would be governed by EA. This is usually done by the executive members within the organisation. Once this has been completed, organisations will have to decide which sections will and will not fall under the EA strategy (Grigoriu, 2007).

2.4.2.2 Implementing EA

Alignment between IT capabilities and business objectives are essential elements for an effective EA implementation. The implementation is sequential in areas where it is understood thus resulting in a number of IT solutions. The EA implementation process needs to consider the technical and economical levels which are also known as the economic aspect of an IT infrastructure. It is important to understand the business processes in order to attain an appropriate strategic foundation for EA implementation. This can be done by outlining important processes for the required levels of integration (Ross et al. 2006; Bonnet, 2009). For an EA strategy to provide business value, the EA implementation process and development should be managed effectively and supported by EA tools. The EA process needs to consider the following in order to achieve business value and success:

- Organisational structure and management controls
- Development of baseline and future architecture
- Development of a transition plan for the future (Schekkerman, 2006).

Schekkerman (2004) elaborates on the importance of the EA budget. The EA budget can vary from organisation-to-organisation, depending on the size of the organisation.

The EA strategy shown in **Figure 3** in outlines the steps involved in the EA process from the initial implementation (mission) to EA measurement. These critical success factors can be associated with the success of EA implementation (Schekkerman, 2004: 39).

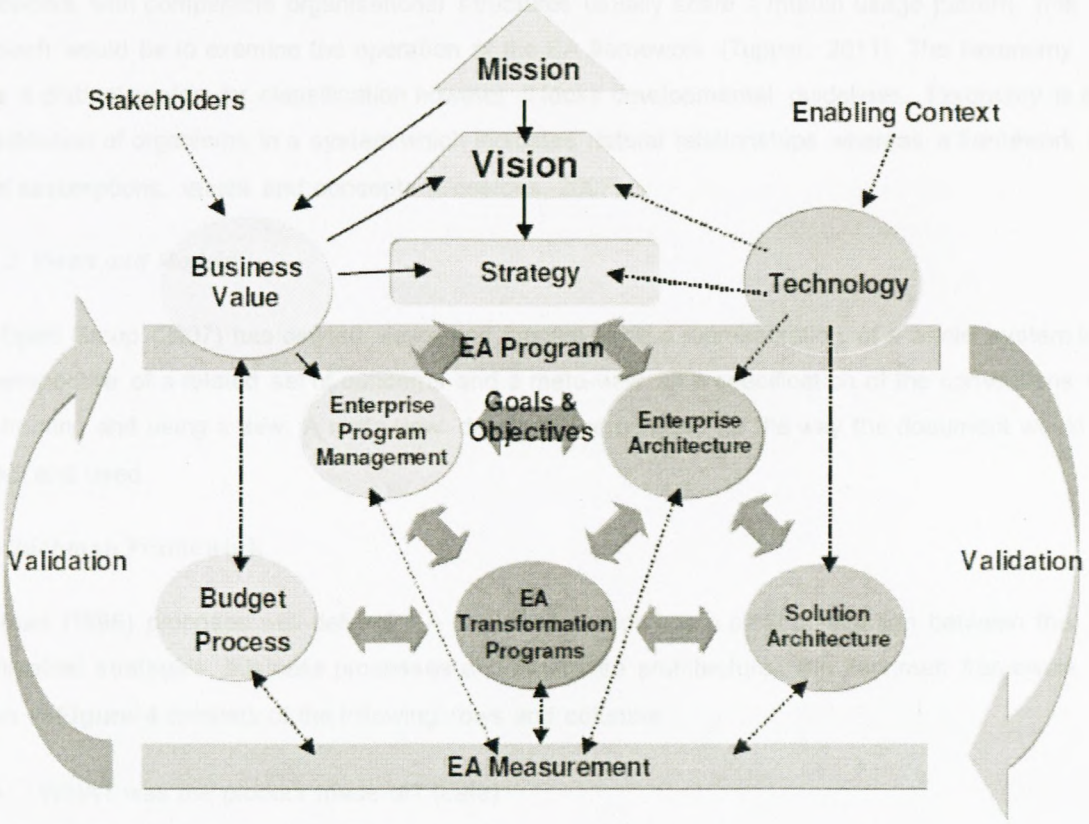


Figure 3: EA implementation (Schekkerman, 2004: 39).

2.5 Comparisons of EA Frameworks

There are several EA frameworks which will be mentioned in this research study. This section will focus on summarising the various EA frameworks into its most fundamental aspects.

EA had been formulated in the mid-1980s when leader John Zachman identified the value and need of architecture for managing and defining the integration of systems (Zachman, 1996).

2.5.1 Evaluating EA Frameworks

Before selecting an EA framework, the framework/methodology/process or strategy needs to be evaluated in order to achieve business success. It can be evaluated as follows:

2.5.1.1 Taxonomy and Framework

The structure of an EA framework stipulates the approach which needs to be taken into consideration for solving organisational challenges and also determining how the framework could be used. EA frameworks with comparable organisational structures usually share a mutual usage pattern. This approach would be to examine the operation of the EA framework (Tupper, 2011). The taxonomy offers a distinct system for classification however it lacks developmental guidelines. Taxonomy is a classification of organisms in a system which indicates natural relationships whereas a framework is a set of assumptions, values and concepts (Sessions, 2007).

2.5.1.2 Views and Models

The Open Group (2007) has defined views and models to be a representation of a whole system from the perspective of a related set of concerns and a meta-view as a specification of the conventions for constructing and using a view. A meta-view develops the purpose for the way the document would be viewed and used.

2.5.2 Zachman Framework

Zachman (1996) proposes well-defined EA framework which has a clear connection between the organisation strategies, business processes and enterprise architecture. The Zachman framework shown in **Figure 4** consists of the following rows and columns:

- WHAT was the product made of? (data)
- HOW had the product work? (function)
- WHERE were the components located to another? (Network)
- WHO does what accordingly to the products? (People)
- WHEN will things occur? (Time)
- WHY are there a number of product choices being made? (Motivation) (Zachman, 2003).

The six questions are important for communication and integration whereby each question has a unique description of enterprise information. The abstraction levels of information are known as rows which has five perspectives:

- *Scope* – Row 1 (Contextual)
  The scope perspective – Establishing the scope; aimed at the planner
- *Business model* – Row 2 (Conceptual)
  The owner's perspective – The recipient (Customer, user) of the product
- *System model* – Row 3 (Logical)
  The designer's perspective – The designer's model who is most likely to be the architect
- *Technology model* – Row 4 (Physical)
  The builder's perspective – The builder to complete the end product

- *Detailed representations* – Row 5 (Out-of-context)

  The out of context perspective – The transformation from media design product to the media end product
- *Functioning enterprise* – Row 6

  This row presents the end product and the functioning of the enterprise (Zachman, 2003).

The Zachman framework is known to be concerned with the content rather than the process, which is also being used as a reference for other EA frameworks. The Zachman framework attracts the obedience of standard architecture with a set of common vocabulary and perspectives thus forming a framework which can describe the most complex organisations. This is done is such a way that each cell in the Zachman framework has its own unique way of seeing an organisations architecture (Nims, 2006).

The Zachman framework can be useful in identifying and organising complex information. In certain cases EA may exist without the use of a formal framework and organisations might have their own specific EA framework. It is important to note that Zachman framework is an ontology and not a methodology (Zachman, 2008).

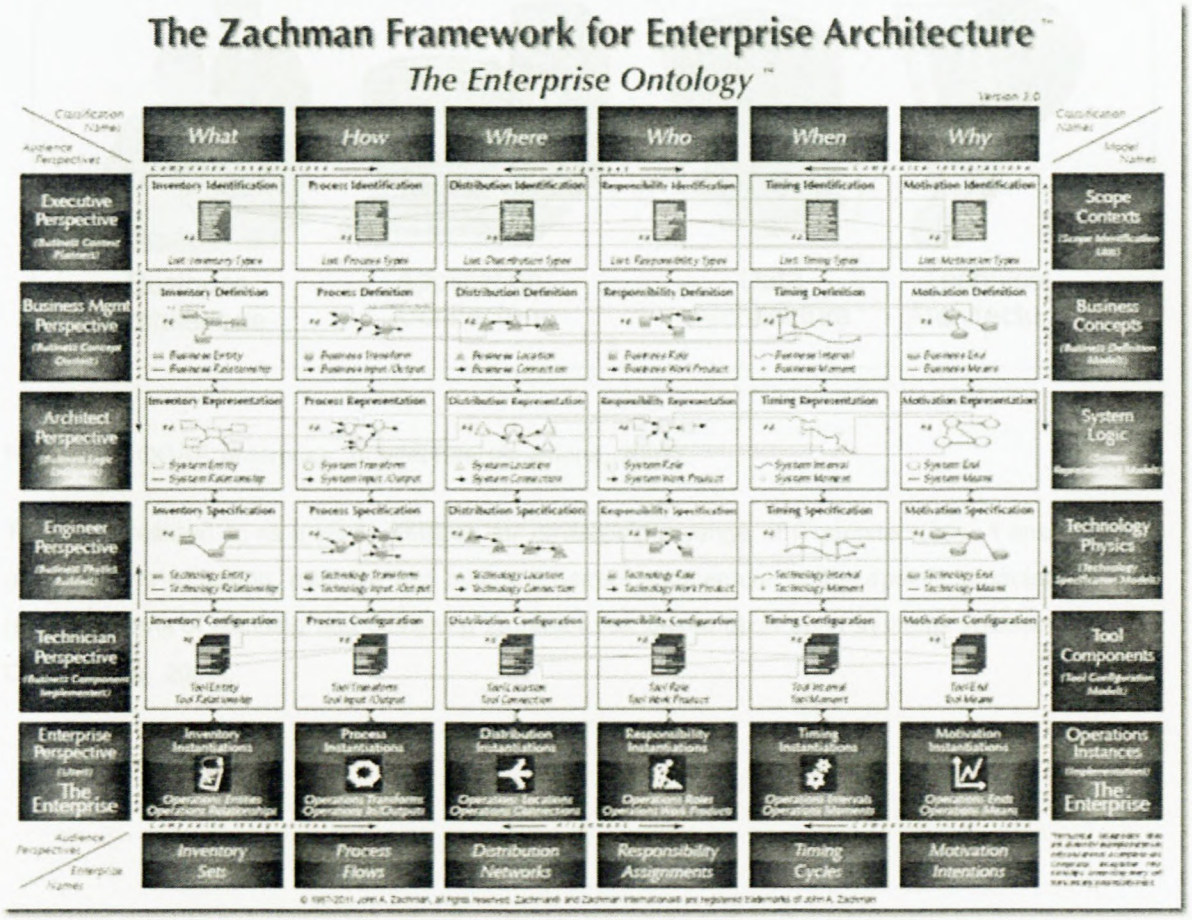


Figure 4: Zachman framework (Zachman, 2012).

2.5.3 The open group architecture framework (TOGAF)

The Open Group Architecture Framework (TOGAF) is an architecture framework which has first been developed in 1995. Several versions have been released with its latest version being Version 9. TOGAF is being used to develop enterprise architecture strategies. TOGAF has two meanings:

- A description of a system.
- The structure of components to govern design and evolution over a period of time (Josey, 2009).

TOGAF shown in **Figure 5** separates architecture into 4 sections, namely:

- Business architecture
- Application architecture
- Data architecture
- Technical architecture (The Open Group, 2007).

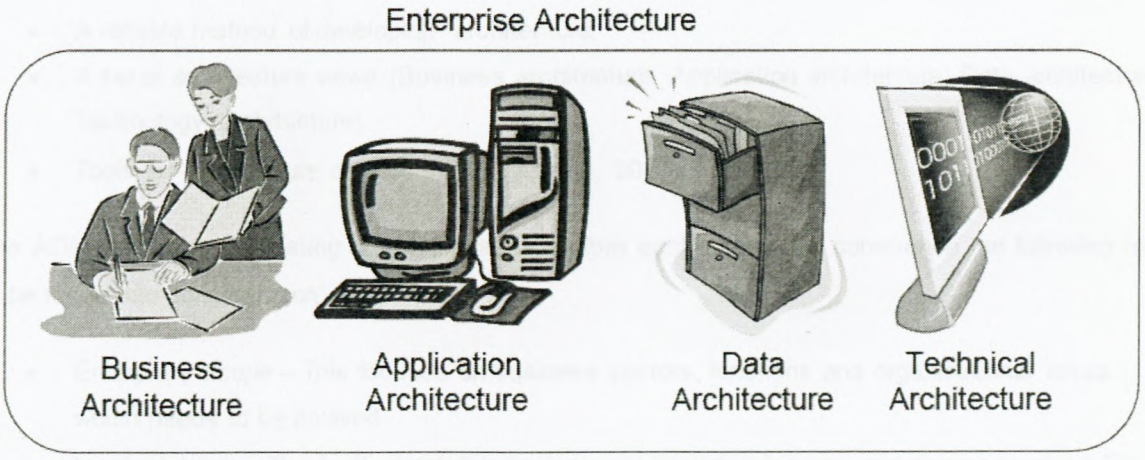


Figure 5: TOGAF enterprise architecture (Sessions, 2007).

TOGAF is referred to as a set of methods for developing a range of IT architectures. It enables organisations to design, evaluate and build the correct architecture for the specific organisation thus reducing costs of planning and designing architectures based upon open systems solutions (The Open Group, 2007).

TOGAF contains the following:

- The ADM (Architecture Development Method)
- ACF (Architecture content framework)
- The enterprise continuum
- TOGAF reference models
- The architecture capability framework (The open group, 2009).

For this research study, The ADM, the ACF and the enterprise continuum will be discussed.

TOGAF is well-known for its ADM and offers a step-by-step explanation for establishing EA within an organisation. The ADM is a multi-stage repetition process personalised to fit any given organisation (The open group, 2007).

The ADM is designed to address business requirements. The TOGAF ADM provides organisations with the following:

- A reliable method of developing architecture.
- A set of architecture views (Business architecture, Application architecture, Data architecture, Technology architecture).
- Tools for architecture development (Harrison, 2007).

The ADM is iterative consisting of many phases. Before each phase can commence the following has to be taken into consideration:

- Enterprise scope – This focuses on business sectors, functions and organisational areas which needs to be covered.
- Level of detail – The level of detail is based upon the intended use and decisions of the EA strategy. Future use of EA also needs to be predicted at this level.
- Time factor – This is described as a single cycle of architecture vision and a set of architectures which enables implementation of the vision (The open group, 2007; The open group, 2009).

The ADM is shown in **Figure 6**:

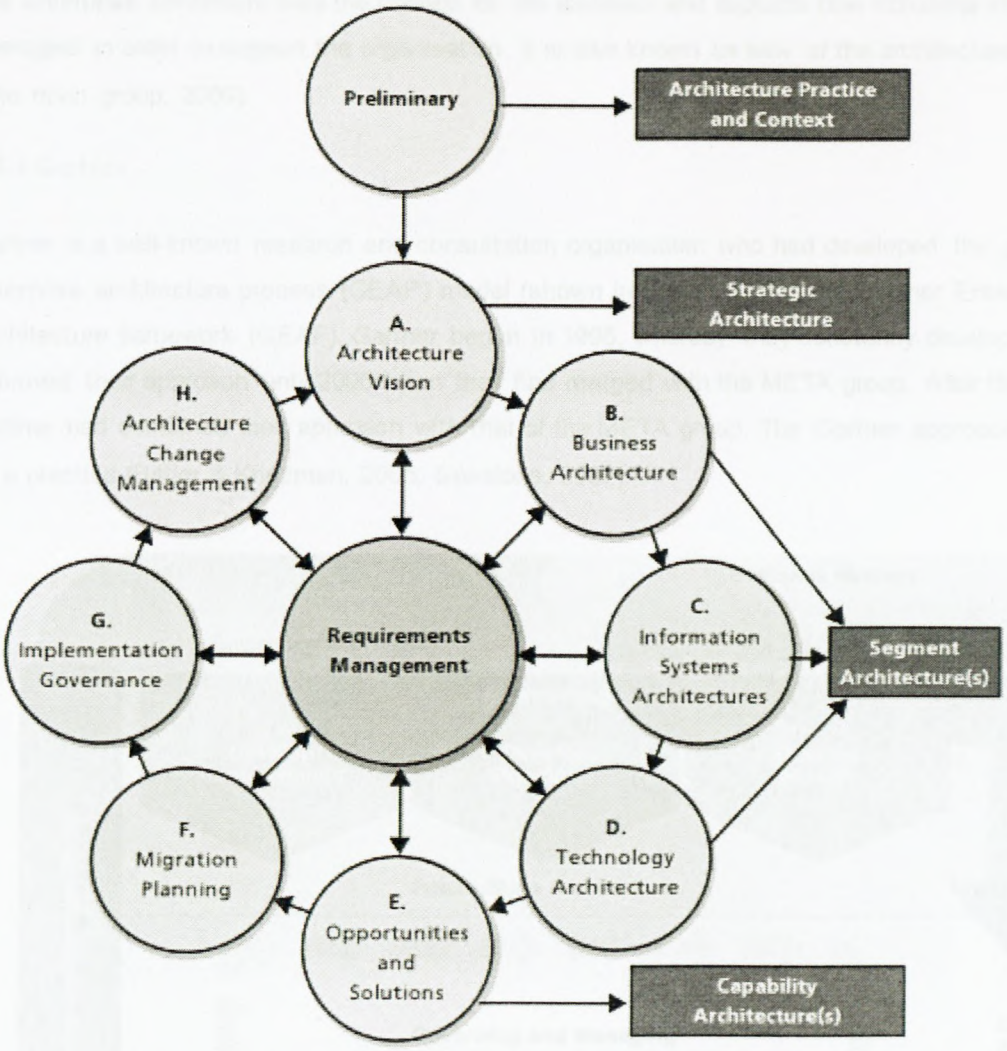


Figure 6: TOGAF ADM (Josey, Harrison, Rouse, Homan, Van Sante, Turner, & Van der Merwe, 2009).

TOGAF uses the ACF to address its models and viewpoints. The ACF which is comparable to that of the Zachman framework offers an organisational structure to support the organisations EA. There are several outputs (architectural requirements, project plans and project compliance) produced during the phases of ADM. In order to collect these outputs it is necessary to have an ACF. The ACF allows for easier referencing and standardisation of EA structuring. TOGAF ACF divides information into three types:

- Deliverables – The output of the project.
- Artifacts – Imperfect information which is taken from diagrams, catalogues or models.
- Architecture building blocks (ABB) – This can be linked to establishing a solution building block. These building blocks are depictions of actionable content which can be utilised in achieving organisational needs (Harrison, 2007; Josey et al. 2009).

The enterprise continuum sets the context for the architect and explains how solutions should be leveraged in order to support the organisation. It is also known as view of the architecture repository (The open group, 2009).

2.5.4 Gartner

Gartner is a well-known research and consultation organisation who had developed the gartner enterprise architecture process (GEAP) model (shown in **Figure 7**) and the Gartner Enterprise Architecture framework (GEAF). Gartner begun in 1996, whereby they constantly developed and improved their approach until 2005 when they had merged with the META group. After the merge, Gartner had combined their approach with that of the META group. The Gartner approach is known as a practice (Bittler & Kriezman, 2005; Sessions, 2007).

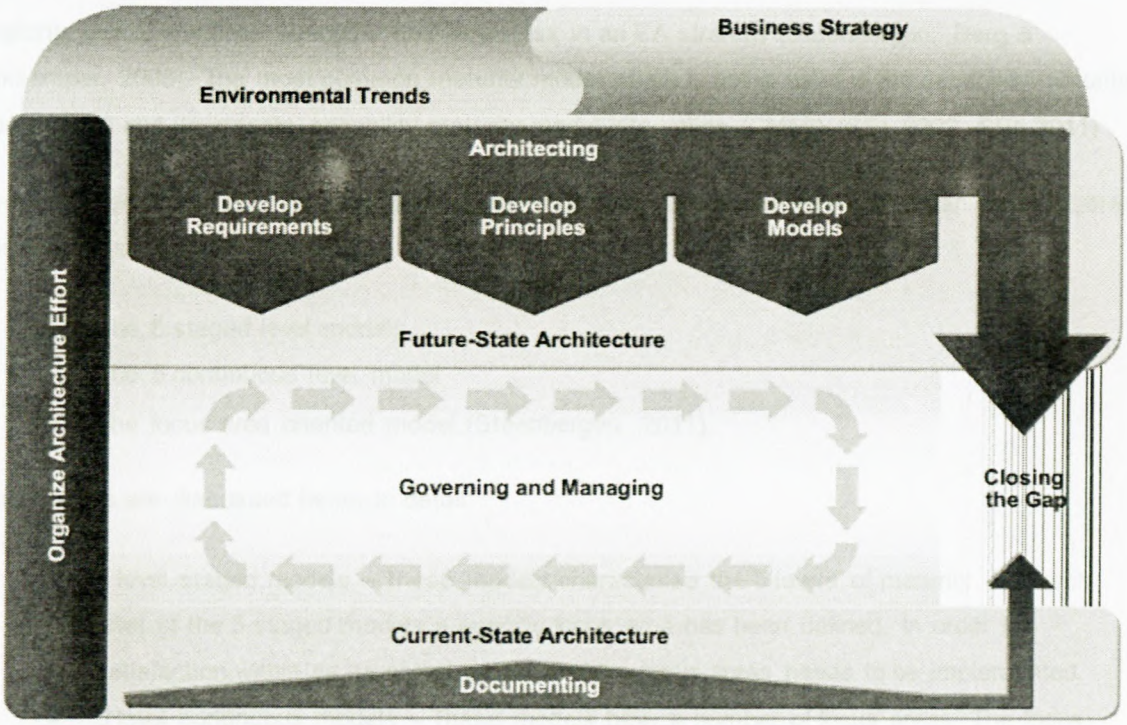


Figure 7: Gartner enterprise architecture process (GEAP) model (Bittler & Kriezman, 2005).

The GEAP model is beneficial to compliment an EA framework as the model adds value to the architecture discipline. Not all EA frameworks has the ability to know what to produce and how they are all related therefore the GEAP model assists in addressing these issues (Bittler & Kriezman, 2005).

Once the organisation has a vision of the future, the impact of that specific vision allow changes to the business and information architectures thus allowing and assisting the Gartner practice to fall into place. Gartner has its focus on discovering where the organisation is going and how will it get there.

The belief of Gartner focuses on the target architecture and not the current state of architecture. Gartner associates three entities, namely:

- Business owners
- Information specialists
- Technology implementers (Tupper, 2011).

2.5.5 Hybrid frameworks

Hybrid EA frameworks can be regarded as linking two or more EA frameworks in order to develop an in-house EA framework to suit specific business needs (Blowers, 2012).

2.6 EA maturity

A maturity model identifies strengths and weakness in an EA strategy (Steenbergen, Berg & Brinkkemper, 2008). The most common maturity model which is being used is the capability maturity model (CMM) and its variants capability maturity model integration (CMMI) (SEI, 2002, SEI, 2011).

There are three basic types of EA maturity models for EA development within an organisation. Listed below are those models:

- The 5 staged level models
- The 5 continuous level model
- The focus area oriented model (Steenbergen. 2011).

These models are discussed below in detail:

- 5 level staged models – These models characterise the 5 levels of maturity. For each level of the 5 staged models a specific focus area has been defined. In order for satisfaction within an organisation each of the focus areas needs to be implemented.
- 5 level continuous models – These models have a number of focus areas. The focus areas are not recognised on each level however within each focus area there are 5 levels (Steenbergen, 2011).
- Focus area oriented model – These models advances from the idea that there are 5 generic levels of maturity. Instead of each level of maturity having its own focus area, the 'focus area oriented model' has an overall maturity of an organisation whereby the maturity of an organisation is expressed as an arrangement of the maturity levels of the specific focus area (Steenbergen, Bos, Brinkkemper, Weerd, & Bekkers, 2010; Steenbergen 2011).

As a result of the three EA maturity models the focus area oriented model would be the preferred type in many organisations as it allows a fine grained approach which is suitable for developing and

improving EA practices rather than simply accessing the current maturity. The focus area oriented model allows organisations to distinguish for more than 5 overall stages of maturity. This allows for small steps between the stages of maturity, which would therefore provide a greater detailed guidance in establishing priorities for the development of architectural practices (Steenbergen et al. 2010; Steenbergen 2011).

The balanced scorecard (BSC) approach is another method of organisational improvement. The BSC is used to assess an organisation corporate performance however the BSC evaluates organisations financial aspects, customer perspective, internal process and learning capability (Kaplan & Norton, 2005). The difference between the BSC and the focus area oriented model is that, the BSC deals with setting specific performance goals and EA measurement, whereas, the focus area oriented model deals with methods in attaining those goals The focus area oriented model has been developed as the architecture maturity matrix. The architecture maturity matrix assists in developing and improving an effective EA practice (Steenbergen, 2011).

Maturity models had initiated when organisations, specifically software development organisations, changed their focus from results of software development to guaranteeing an enhancement in the process used. The final result was to allow organisations to eradicate defective outcomes by outlining and removing imprecise processes. Organisations that lack maturity models will either over spend on process improvement or under spend on process improvements as they are unaware of how to proceed to in the most appropriate manner (The Open Group. 2007; Steenbergen, 2011).

CMMs are another method for determining an organisations maturity level. The CMM provides an effective method for organisations to control and improve their EA strategy. The CMM provides the organisation with the following benefits:

- Improvement practices for organisations.
- Measurement improvements.
- A framework to manage all improvements (The open group, 2007).

The software engineering institute (SEI) developed a framework called the capability maturity model integration (CMMI) which assists in managing complex organisations. The CMMI enables organisations to:

- Explicitly link activities to business objectives.
- Expanding the scope of the specific products or services to meet customer expectations.
- Complying with ISO standards (SEI, 2002; The open group, 2007).

The CMMI is divided into 5 maturity levels, namely:

1. Initial – Processes are still in a chaotic form. Usually projects are not on schedule and budgets are overspent.

2. Managed – Requirements are managed and organisations have their processes planned and controlled.

3. Defined – Processes are understood and are described in standards and procedures.

4. Quantitatively Managed – Organisation have achieved desired goals assigned to the processes.

5. Optimising – Processes are continuously being improved.

Each level assists the organisation in optimising its process improvements. Organisations can achieve drastic improvements by committing to each level of maturity (SEI, 2002).

2.7 EA measurement strategies

EA measurement strategies are used to determine the value and effectiveness of EA to an organisation. EA measurement does not occur immediately however it is an organised maturation process (Jahani, Javadein, & Jafari, 2010). Potts (2010) explains the importance of EA measurement, stating that measuring EA can assist in determining the organisations strengths and weakness. Enterprise architects should constantly measure the value of EA in order to enhance the performance of an EA strategy. The EA measurement strategy can therefore be used as a guideline for EA decisions and investments.

The BSC has been used internationally to align business activities to the vision and mission of an organisation, to improve communication and to monitor organisational performance against strategic goals (Kaplan & Norton, 2005). Kaplan and Norton (1996) have described the BSC to be a strategic plan and management system to closely align the business activities with the vision of an organisation which can also translate the mission of an organisation into the practicalities of the business.

The BSC pyramid shown in **Figure 8** focuses on the developing the entire BSC for an organisation beginning at the mission statement through to the initiatives. The mission statement is a concise representation of an organisations function for existence. It expresses to others within the organisation what their purpose is, thus the mission statement being right at the top of the BSC pyramid (Kaplan & Norton. 1996).

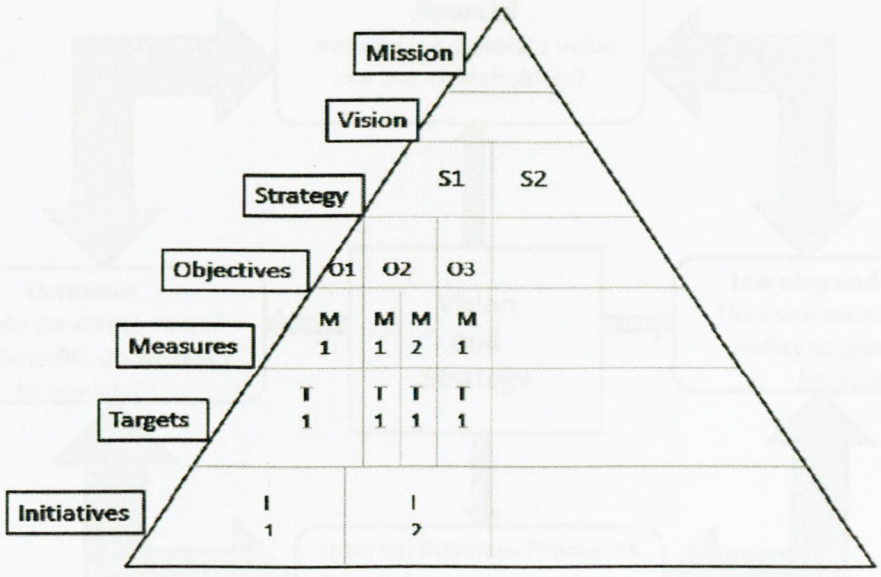


Figure 8: The balanced scorecard pyramid (Kaplan & Norton, 1996).

For an organisation to effectively realise business goals, the BSC has four domains. Each domain can be used to identify the businesses critical success factors.

- The *financial perspective* captures the business value which has been created from various investments. It ensures that the correct initiatives are taken to capture the return on capital, asset utilisation and shareholder value.
- The *customer perspective* ensures that the customers are contented with the business and its deliverables by measuring customer relationships, service attributes and the reputation of the organisation.
- The *internal business perspective* measures the developed products and services, it also evaluates the IT processes.
- The *learning and growth perspective* addresses the sustainability of the business to improve and change overtime in order to attain the organisations vision. It measures the employee and information system capabilities as well as the motivation and empowerment capabilities (Kaplan & Norton, 1996).

These above domains are shown below in **Figure 9**:

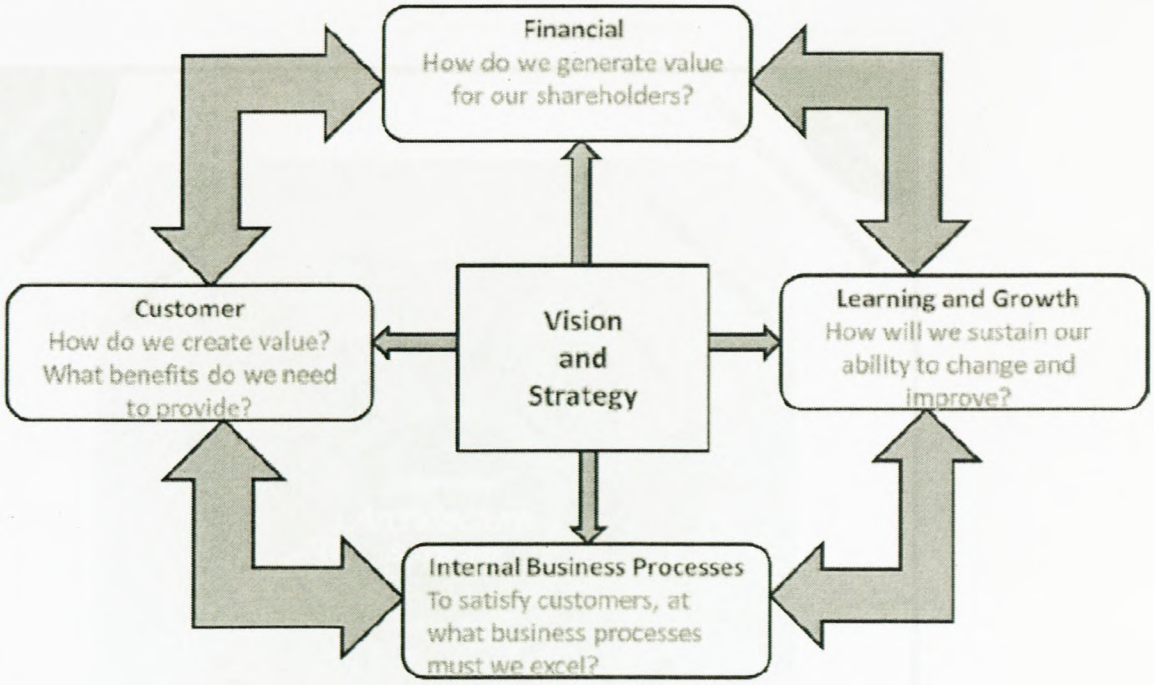


Figure 9: Balanced Scorecard Perspectives (Kaplan & Norton, 1996).

These four domains articulate a complete description of what exactly an organisation needs to know. It preserves an inclusive understanding of the organisations mission and vision allowing an organisation to establish the most appropriate strategies. Objectives are defined for each domain according to the strategies (Kaplan & Norton, 1996; Lawrie & Cobbold, 2007). The BSC offers a set of measurement metrics which provides a scale for measuring organisational success. Targets are established and set which relates to the measurement metrics. Once the targets have been set, explicit initiatives are laid out for management in order to achieve those targets (Kaplan & Norton, 2006).

Schelp and Stutz (2007) have done an extensive research on the BSC and EA. The use of a BSC as a measurement tool within an organisation can demonstrate to executive members that resources are being used in the most effective manner. Schelp and Stutz (2007) have designed a framework to integrate all aspects of the BSC and EA which presents information at various points, thus allowing better decision making within the organisation. The original BSC terminology has been renamed with EA terminology, as stated below:

- The customer perspective into *Service*
- The internal business perspective into *Processes*
- The innovation and learning perspective into *Assets*
- The financial perspective into *Finance*

These EA terminologies are shown in **Figure 10**.

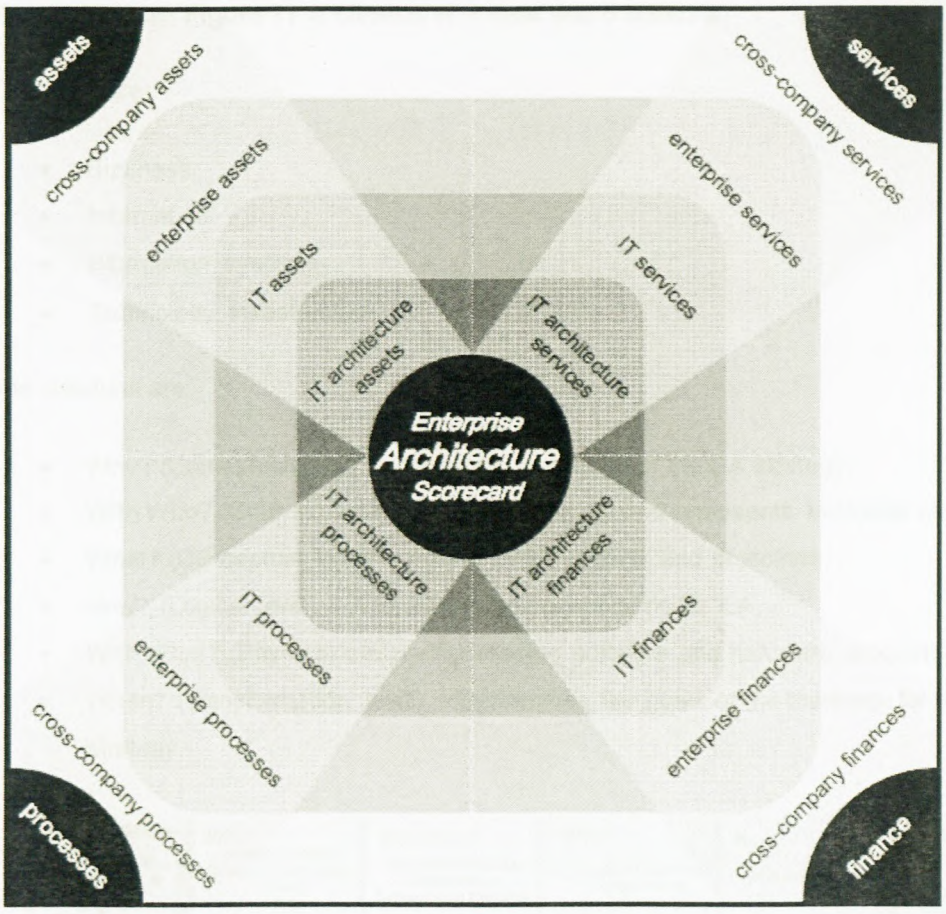


Figure 10: EA scorecard framework (Schelp & Stutz, 2007).

From the above **Figure 10** the inner structure addresses the four perspectives in the context of IT architecture. Resource allocations are measured within the inner structure. The second structure represents resource allocations of the four perspectives but in the context of IT. The third structure measures the scope of EA and the fourth structure measures the cross-company. Within the EA context, it is important to associate measurements directly with the business strategy (Schelp & Stutz, 2007).

Erbert, Dumke, Bundsch and Schmietendorf (2005) explain EA measurement through the use of CMMI and GQM (goal question metric). The CMMI assists organisations in improving maturity and the GQM provides a view of what measures will be most useful to the organisation. The GQM relates to why an attribute needs to be measured and the CMMI would allow the organisation to validate if the measurement is being done in an appropriate manner.

Schekkerman (2006) developed an EA scorecard to evaluate EA measurement within the organisation. The EA scorecard is based upon the extended enterprise architecture framework (E2A). The E2A shown **Figure 11** in consists of 4 rows and 6 columns.

The rows are:

- Business
- Information
- Information systems
- Technology Infrastructure

The columns are:

- Why? (Contextual level) – Describes the scope of the EA strategy.
- With Who? (Environmental level) – Describes who represents business and technology.
- What? (Conceptual level) – Addressing the goals and objectives.
- How? (Logical level) – Addressing logical solutions for EA.
- With What? (Physical level) – Addressing software and hardware products.
- When? (Transformation level) – Determines the goals of the roadmap for the specific EA strategy.

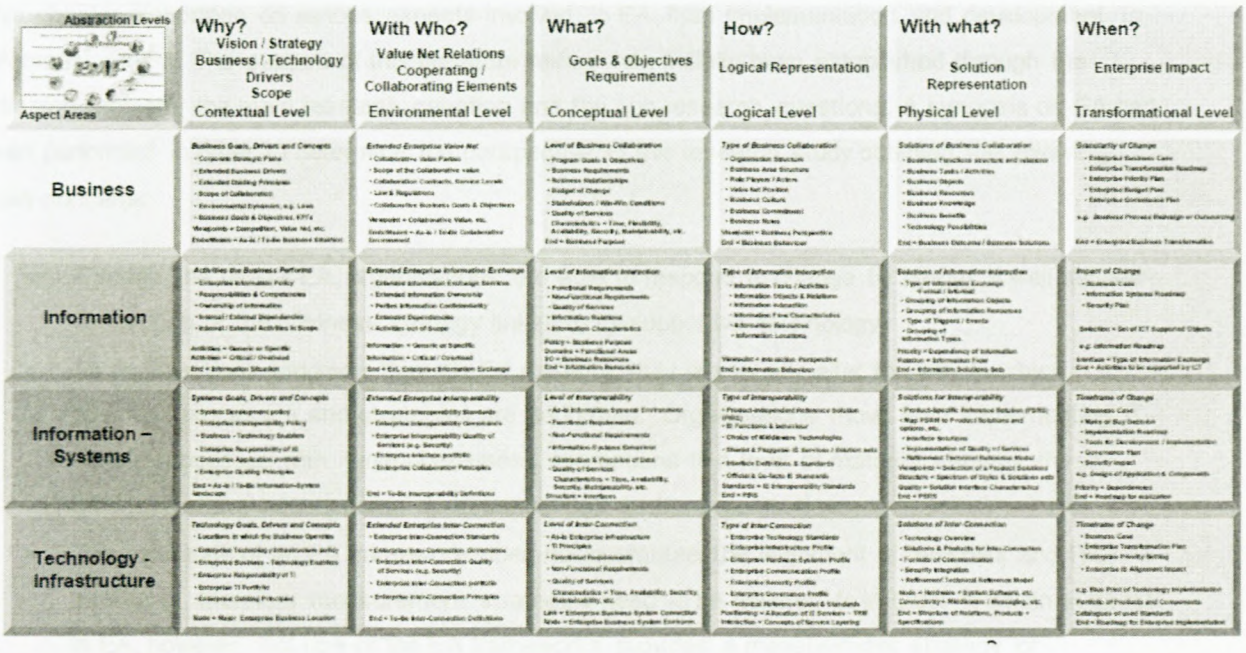


Figure 11: Extended enterprise architecture framework (E2A) (Schekkerman, 2006).

The EA scorecard is based upon the elements described in the E2A framework posing various questions to organisations/enterprise architects. Organisations/enterprise architects are able to calculate each sector (Schekkerman, 2006).

Each question is assessed with the level of alignment and integration as well as the 4 rows and 6 columns as described in the E2A framework. The EA scorecard calculations are based upon the following criteria:

- Unknown = 0
- Partially known and partially documented = 1
- Fully known and fully documented = 2 (Schekkerman, 2006).

2.8 Development of themes from literature

The following themes had been developed based upon the literature which will be used in Chapter 4:

- EA implementation and the IT department
- EA growth and influential factors
- EA satisfaction
- EA business case selection
- EA maturity
- EA measurement

2.9 Summary

This chapter elaborates on various aspects involved in EA, from implementation and development to EA measurement. The support of this literature review had initially been established through the research problem, the main research question and the sub-research questions. A synopsis on EA had been performed in order to determine the perspective of this research study outlining the following main concerns:

- Through the use of EA, organisations are able to respond to change by having a well-defined description of the business strategy linked to its supportive technology.
- As organisations progress through EA maturity, they essentially alter the way in which business processes and strategies are performed. Organisations move from implementing IT-enable processes with minimal business interactions to a level of maturity whereby these processes have now become an essential part for the organisation.
- The existence of an EA framework does not guarantee the alignment of business and IT strategies, therefore measurement strategies need to be adhered to in order to attain success in EA, however, not one of the EA frameworks provides a measurement strategy for organisations. Thus the BSC could assist in measuring the effectiveness of EA to an organisation.

Chapter 3: Research Methodology

3.1 Introduction

The research methodology outlines the research study, which methods and procedures had been used and how they best fit to answer the research questions (Creswell, 2003:4). The research approach had been used as a guideline to conduct the research study as per the research questions. Specific aspects have been discussed relating to qualitative research. This chapter elaborates on the research philosophy, research approach, research strategy and data collection techniques which were used to collect data. The researcher then presents the data reliability and validity, data analysis, ethical considerations and ends off with a summary.

This research study uses a subjective ontology which analyses and explains the research through an interpretivist lens followed by an inductive approach. Interpretivism is suitable for this research study as EA measurement is relatively new in the field of EA, thus leading the research to explore and understand the phenomena through interpreting meanings from various participants (Neuman, 2006:88). Qualitative methods such as interviews and surveys were used for the data collection process.

The research design strategy used in this research study is presented in **Figure 12**.

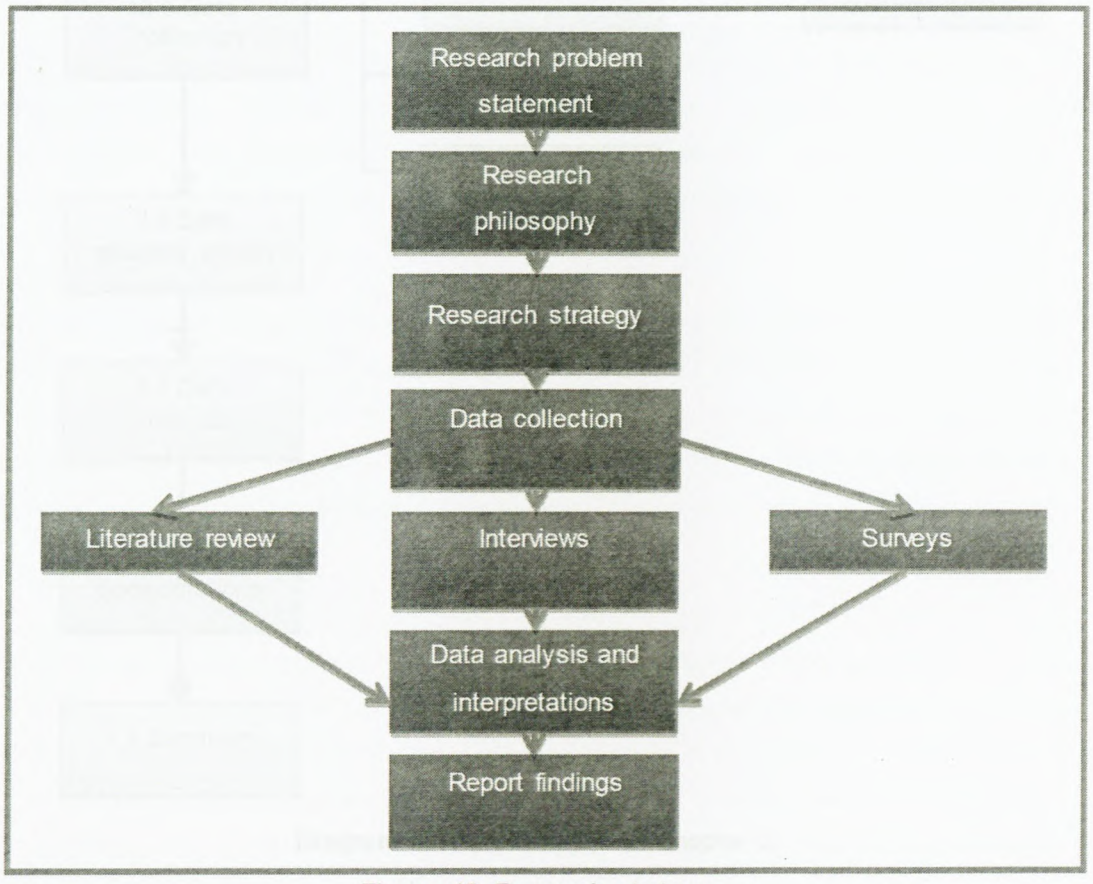


Figure 12: Research strategy

Diagram 3 depicts the structure of Chapter 3.

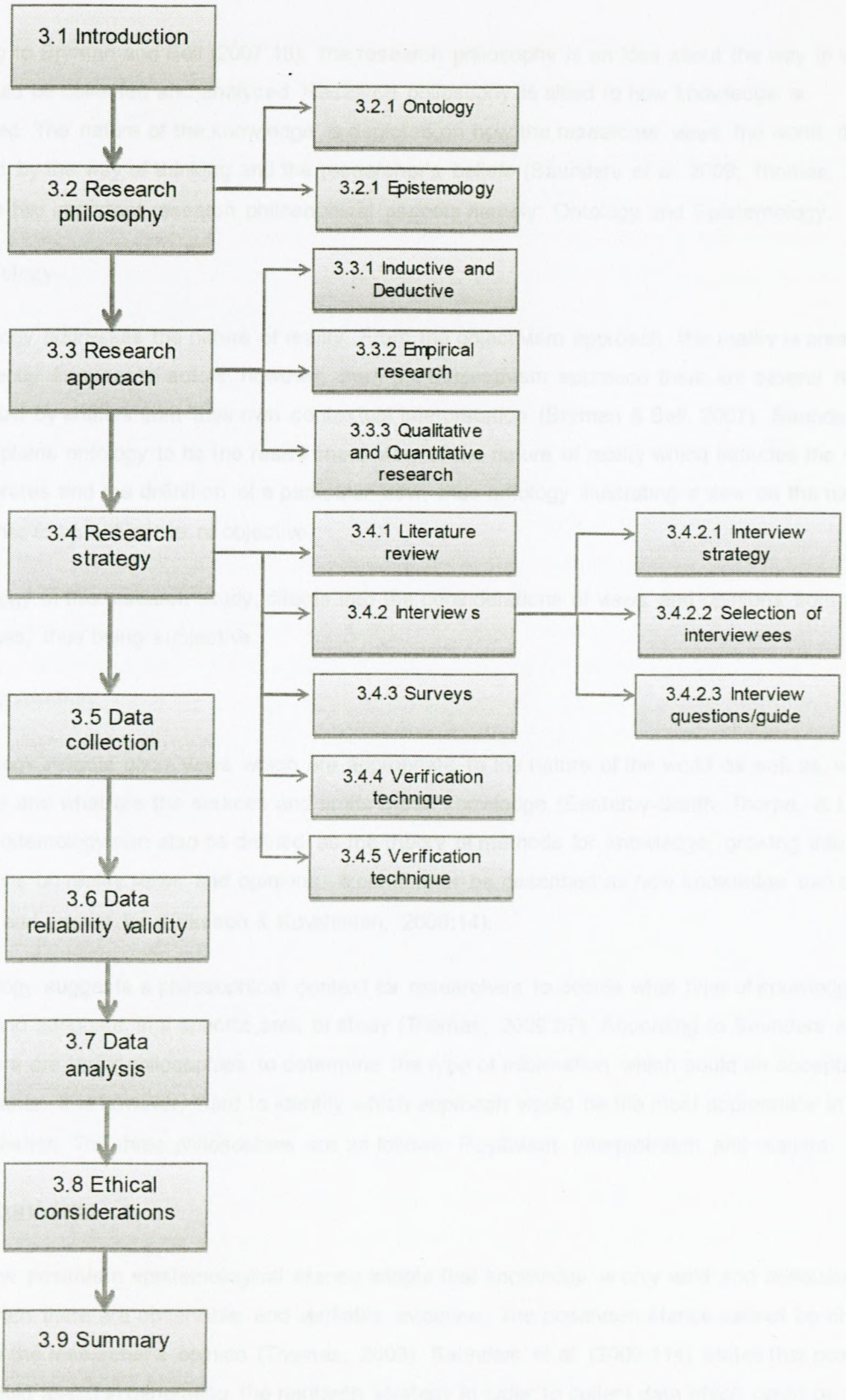


Diagram 3: Representation of Chapter 3.

3.2 Research philosophy

According to Bryman and Bell (2007:18), the research philosophy is an idea about the way in which data should be collected and analysed. Research philosophy is allied to how knowledge is established. The nature of the knowledge is depicted on how the researcher views the world. It can be influenced by the way of thinking and the researcher's beliefs (Saunders et al. 2009; Thomas, 2009). There are two important research philosophical aspects namely: Ontology and Epistemology.

3.2.1 Ontology

The ontology addresses the nature of reality. From the objectivism approach, the reality is created independently from social actors, however, from the subjectivism approach there are several realities socially built by entities from their own contextual interpretation (Bryman & Bell, 2007). Saunders et al. (2009) explains ontology to be the researchers view of the nature of reality which includes the way the world operates and the definition of a particular view, thus ontology illustrating a view on the nature of reality either to be subjective or objective.

The ontology in this research study, directs into the considerations of views and opinions from several perspectives, thus being subjective.

3.2.2 Epistemology

Epistemology reflects upon views which are appropriate to the nature of the world as well as, what is knowledge and what are the sources and limits within knowledge (Easterby-Smith, Thorpe, & Lowe, 2004). Epistemology can also be defined as the theory of methods for knowledge, growing into assumptions on reality views and opinions. It can further be described as how knowledge can be produced and argued for (Eriksson & Kovalainen, 2008:14).

Epistemology suggests a philosophical context for researchers to decide what type of knowledge is effective and adequate in a specific area of study (Thomas, 2009:87). According to Saunders et al. (2009) there are three philosophies to determine the type of information which could be acceptable to the researcher. It is however, hard to identify which approach would be the most appropriate in a certain question. The three philosophies are as follows: Positivism, interpretivism and realism.

Positivism:

The positivism epistemological stance adopts that knowledge is only valid and adequate when there are observable and verifiable evidence. The positivism stance cannot be changed by the researcher's opinion (Thomas, 2009). Saunders et al. (2009:114) states that positivism could assist in generating the research strategy in order to collect data which could be utilised to improve the hypothesis with the aid of existing theories. A positivist researcher performs data collection in a social environment involving people's reactions and responses.

Interpretivism

Interpretivism is dissimilar to positivism, in such a way that Interpretivism confirms that each individual interprets the world in a unique way, thus the truth for someone might be in untrue to others. An Interpretivist needs to fully understand reality through a subjective interpretation of an intervention, however an interpretivist admits to the fact that there might be many interpretations of reality but they preserve that the interpretations are of scientific knowledge (Sayer, 2000; Denzin & Lincoln, 2007). By the interpretive approach, researchers debate that the perspective from an interpretivist is the most appropriate in business research and management studies (Saunders et al. 2009:116).

Realism:

Realism shows the reality of truth. The philosophy of realism is the reality which is independent of the mind. Critical realism is a philosophy for social science concerning the theory of knowledge. This is based upon ideas which may or may not be true (Sayer, 2000). Reality can be understood through the use of empirical realism (Bryman & Bell, 2007:18).

Having said this, a subjective interpretivism stance identifying that reality is socially constructed was taken upon, as to the positivism and realism approach, thus the researcher gives guidelines and suggestions for enhancing EA in organisations. These guidelines and suggestions are however based upon personal interpretations from the researcher's viewpoint.

3.3 Research approach

There are various research approaches. These approaches are described below in detail.

3.3.1 Inductive and Deductive

According to Zikmund et al. (2012:47) deductive research is a study whereby the theoretical structures and conceptual structures are established which can be tested by empirical observations; therefore particular occurrences are deducted from general influences. The deductive approach involves new theories to be tested.

The inductive approach is known as the study whereby theory is developed from observing the empirical reality which allows general deductions to be induced from a particular occurrence (Zikmund et al. 2012:44). Babbie (2009) states that the inductive research approach entails data collection, thereafter theory needs to be developed as an outcome of the data analysis.

This allows an understanding of the subject area within EA measurement. The outcome of this interprets the research study to be an inductive approach.

3.3.2. Empirical research

The empirical research is based upon observation, experience or conducting secondary analysis based on existing data (Bryman, 2012). This research study has applied empirical research. Chapter 2 represents that there has been a substantial amount of research done on EA; however limited research has been done on EA measurement within South African organisations. The empirical research of this research study was directed at developing an understanding of the challenges which South African organisations are faced with during EA implementation and more specifically during EA measurement.

3.3.3 Qualitative and Quantitative research

Another distinction in the research approach is the categorisation of quantitative and qualitative research (**Table 1**). This research study involves a qualitative research approach in order to answer the various research questions outlined in Chapter 1. The qualitative research approach concentrates on attaining a richer understanding of how people's perspectives are behind their behavior (Bryman, 2012). One of the capabilities of qualitative research is to allow the researcher a world-wide view of the experience of other researchers (Yin, 2011).

Table 1: Distinctions between quantitative and qualitative data (Saunders et al. 2009: 482)

Quantitative Data	**Qualitative Data**
Based upon meanings which are attained from numbers.	Based upon meanings which are expressed in the form of words.
Results are collected in numerical and standardised data.	Results are collected in non-standardised data which requires classification.
Diagrams and statistics are used to perform analysis.	Conceptualisation is used to perform analysis.

This research study serves to understand the challenges which organisations are faced with in the context of EA. A qualitative approach had been used which fits in with Zikmund et al. (2012) stating that a qualitative researcher has a subjective approach which includes exploring and reflecting upon perceptions in order to gain an understanding.

3.4 Research strategy

Using an interpretivism stance enables the research study to broaden its research in terms of theoretical findings from other multiple narratives. The research strategy involves literature review, surveys and interviews by means of semi-structured interviews. **Table 2** outlines the data collection methods.

Table 2: Data collection methods

Data collection methods	Reference to data collection methods
Literature review	The literature review provides insight to previous work which had been on a specific topic. It explains important factors and extracts main points and issues which can be critical to the researcher (Ridley, 2012). The literature review has been discussed in **3.4.1 Literature review.**
Interviews	Detailed questions can be explored and addressed during an interview allowing valid and reliable answers to the interviewee (Creswell, 2003). The Interview has been discussed in **3.4.2 Interviews.**
Surveys	Surveys can be used to study individual people as the unit of analysis or it can be used to study a group of respondents. Surveys are suitable to describe large population responses to a specific situation (Babbie, 2009). The survey has been discusses in **3.4.3. Surveys.**

The research strategy assists the researcher to construct a general plan in order to achieve research goals and objectives. The strategy stipulates various steps or phases on how the research should be fulfilled, how the research questions should be answered and lastly how the data for the research study should be collected (Marshell & Rossman, 2011).

The researcher attempts on making significant meanings without portraying pre-existing expectations based on how data has been collected and analysed. An interpretivist research commence with undertaking a literature review searching to gain extensive knowledge around the topic of EA followed by theory development and data collection methods.

3.4.1 Literature review

The literature review substantiates motivation behind a specific research area underlying assumptions based upon the provided research questions. It is also known as a discussion between the researcher and related literature within a specific field of research (Marshall & Rossman, 2011:78).

The purpose of this research is to administer the current state of EA within South African organisations; to determine where exactly the EA program is in terms of EA maturity and what measurement strategies had been used. The objectives were to establish the following:

- To understand EA implementation and EA maturity in organisations.
- To determine the reason for EA measurement and possible EA measurement strategies that had been previously used.

The resources were mainly attained through the Cape Peninsula University of Technology library which provides access to articles, journals, books, e-books. Other databases such as Sciencedirect, Emerarld and ACM digital library were also used.

3.4.2 Interviews

After the literature review had been completed, interviews were performed with EA experts who have experience and knowledge on various EA frameworks, implementation and development. Interviewees were selected based upon their experience in the EA field.

3.4.2.1 Interview strategy

The main method of data collection was done by means of interviews. A semi-structured one-on-one interview process was used as it allowed the interviewee to share a common understanding of EA and their relations with EA in the specific organisation. This method had assisted the researcher to attain data in a dynamic way rather than having singular questions which are answered one-by-one. It had also allowed the interviewer and the interviewee to go back and forth with some of the questions, whilst the interviewer could still be in complete control over the interview as suggested by Kvale and Brinkman (2009).

The interview process was aimed at understanding the following objectives:

- Understanding EA in full context to the organisation as well as EA implementation and development.
- The challenges which organisations are currently being faced with in terms of EA, EA maturity, EA measurement (which measurement strategies had been used and the complexity of EA measurement).

Prior to the interview, arrangements had been made via email requesting the consent of the interviewee if he/she would participate in the data collection for this research study. Once the interviewee accepted the task, a brief summary had been given to the interviewee before the interview took place. This had allowed the interviewee to gather all necessary information beforehand pertaining to the list of questions which were posed to the interviewee.

3.4.2.3 Selection of interviewees

In order to evaluate EA and EA measurement, EA experts (**Table 3**) had been selected with both theoretical and practical background in the field of EA. A semi-structured in-depth interview had been done with various participants in order to gain an understanding of EA in the organisation (Kvale, 1996).

Based upon the selection of EA experts, adequate data collection could be performed and analysed for this research study.

Table 3: The EA experts interviewed

Name	Job description	Number of years in the field	Organisation type
Expert 1	Senior enterprise architect	13	Financial and insurance
Expert 2	IT architect	15	Financial (Investment)
Expert 3	Enterprise architect	10	Financial (Investment)
Expert 4	Business/information architect	8	Financial (Bank)
Expert 5	IT manager	20	Insurance
Expert 6	Solutions architect	10	Mobile network provider
Expert 7	Domain architect	5	Retail

3.4.2.3 Interview questions/guide

The interview questionnaire (Appendix A) was used as the main form of data collection for this research study, therefore question selections were of importance in order to answer the intended research questions. The interview questions had been divided into themes whereby objectives have been outlined for each theme. For an ease of understanding, the interview questions, themes and objectives are shown in **Table 4**.

Table 4: Interview questions, themes and objectives

	Interview Questions	Themes	Objectives
Section 1	**Question 1:** Does your organisation utilise a formal enterprise architecture framework? **Question 1a:** If "yes" answered to question 1, which specific enterprise architecture framework is being used? **Question 2:** If there is an existing enterprise architecture framework, how long ago had it been implemented? **Question 3:** Why are enterprise architects unable to realise the benefit s of enterprise architecture, once enterprise architecture has been initiated and implemented?	**EA implementation**	Determining the EA level within the organisation in terms of EA frameworks; EA implementation and the enterprise architects success criteria.

Section 2 continuation	**Question 4:** What in-house factors could possibly affect the implementation and development of enterprise architecture within an organisation? **Question 5:** What external factors could possibly affect the implementation and development of enterprise architecture within an organisation? **Question 6:** From a financial perspective, what needs to be taken into consideration for the implementation and development of an enterprise architecture strategy? **Question 7:** How readily available are the enterprise architecture resources? **Question 8:** What were the organisational goals for the enterprise architecture strategy?	**EA growth and influential factors for EA**	Identifying the key factors which could possibly influence the EA strategy.
Section 3	**Question 9:** What characteristics of enterprise architecture is the organisation most satisfied with? **Question 10:** What characteristics of enterprise architecture is the organisation dissatisfied with?	**EA satisfaction**	Determining and outlining factors which organisations are most and least satisfied with for EA.

Section 4	**Question 11:** Once the business case had been developed for enterprise architecture, was any value metrics used to assist the business case? **Question 11a**: If "yes" answered to question 11, what value metrics had been used?	**EA business case selection**	Determining whether or not the organisation have/had used a business case, and if so what value metrics were used for EA.
Section 5	**Question 12:** How could enterprise architecture maturity be defined in your organisation? **Question 13:** When would you consider enterprise architecture to have reached its matured state? **Question 14:** What would be regarded as critical success factors for achieving enterprise architecture maturity?	**EA maturity**	Identifying and determining the level of EA maturity within organisations.
Section 6	**Question 15:** Does your organisation have any plans of implementing a measurement strategy for enterprise architecture? **Question 15a:** If "yes", what measurement strategy has been used? **Question 15b:** If "no", why has no measurement strategy been used?	**EA measurement**	Identifying and establishing the core elements of EA measurement as a success criterion for organisations. Determining the benefits which EA measurement could offer the organisation as well as determining viewpoints on the BSC as a potential measurement tool for EA.

Section 6 continuation	**Question 16:** With regards to enterprise architecture measurement, would you regard measurement to be beneficial? **Question 17:** What would you like to achieve from the measuring enterprise architecture strategy? **Question 18:** Would the balanced scorecard be a potential measurement tool for enterprise architecture?		

3.4.3. Surveys

Surveys usually follow the quantitative approach; however, in this research study the survey followed a qualitative approach. A survey is a systematic method for data collection from a number of participants. The qualitative approach for surveys does not aim at establishing occurrences in a specific situation but aims at the diversity of a specific topic within a given area of study (Jansen, 2010:3).

There are two types of surveys, namely:

- Cross sectional surveys – These types of surveys collects data from participants at a single point in time
- Longitudinal surveys – These types of surveys collects data from participants over a period of time for the researcher to analyse the changes within the area of study (Babbie, 2009:110).

There are three types of survey questions, namely:

- Open-ended questions – Participants are requested to give their own opinion based on the specific question
- Partially open questions – Participants are given a selection of answers for the specific question, however if the participant feels that the answer is inappropriate to the selection of answers, he/she can alternatively answer the question in the "other" section provided in the list of answers
- Closed-ended questions – Participants have a list of answers which they need to choose from. It can either be multiple choice, likert scale, numerical or ordinal questions (Neuman, 2006:287).

The survey instrument for this research study has been based upon a cross sectional survey with open-ended, partially open and closed-ended questions. The survey had been distributed online using www.esurveyspro.com. The survey questions are shown in Appendix B.

The survey had been divided into themes in order to collect information from various aspects around EA. For an ease of understanding, the survey questions, themes and objectives are shown in **Table 5**.

Table 5: Survey questions, themes and objectives

	Survey Questions	Themes	Objectives
Section 1	**Question 1:** How significant is the IT department and its success for the organisation? **Question 2:** How fundamental is business needs to the IT department? **Question 3:** How well does the organisation mitigate IT risks and assuring that IT is on its top performance? **Question 4:** Does your organisation make use of any formal enterprise architecture framework? **Question 5:** If yes answered to question 4, which framework does your organisation make use of? **Question 6:** How complex was the implementation process of enterprise architecture within the organisation?	**EA implementation and the IT department**	Establishing and understanding the value which the IT department and EA dominate within an organisation.

Section 2	**Question 7:** How acquainted are executive managers with the enterprise architecture strategy? **Question 8:** In terms of enterprise architecture maturity, describe the current results of the EA strategy within the organisation?	**EA maturity**	Identifying and determining EA maturity within an organisation.
Section 3	**Question 9:** Does your organisation have any plans of implementing a measurement strategy for enterprise architecture? **Question 10:** With regards to enterprise architecture measurement, would you regard measurement to be beneficial? **Question 11:** Would the balanced scorecard be a potential measurement tool for enterprise architecture?	**EA measurement**	Identifying EA measurement strategies and determining various viewpoints on the BSC as an EA measurement tool for an organisation.

As for the survey, 50 respondents were invited to complete the survey, however, only 23 respondents responded to the survey link, whereby 20 surveys were completed and 3 surveys were left incomplete with no given reason.

3.4.4 Unit of analysis

The unit of analysis in research specifies who or what should provide data and at what level of aggregation. The researcher should indicate whether or not the research study provides data about individuals, organisations, objects or geographical areas (Zikmund et al. 2012:118).

The unit of analysis for this research study is based on EA. The case for this research study is brought upon by examining the EA strategy in various organisations; individuals who are working on the EA strategy and individuals who have an influence on the EA strategy.

3.4.5 Verification technique

The verification criterion was done by experts in the field of EA who had examined the interview questionnaire and surveys. A checklist determines whether or not you have clearly defined your questions as it needs to relate to the research questions and research sub-questions (Bryman & Bell, 2007). A checklist had been given to in-house experts to validate the questions determining whether or not the interview and survey questions addressed the research questions and objectives.

The checklist provided in **Table 6** is based on validating and verifying the questions which had been posed in the interview questions and survey questions.

Table 6: Verification/Validation checklist

Objective	Verification/Validating criteria	Check
Determining the EA strategy, EA selections, EA frameworks, EA business case and metrics in the organisation?	Does the questionnaire and survey address all aspects of EA within the organisation?	Yes/No
	Does the questionnaire and survey address the advantages and disadvantages of EA?	Yes/No
	Does the questionnaire and survey establish a baseline of the EA strategy in terms of its future success?	Yes/No
Determining the current level of EA maturity within the organisation?	Does the questionnaire and survey examine fundamental aspects of EA maturity in organisations to determine their level of maturity?	Yes/No

Determining the factors of EA measurement in organisations?	Does the questionnaire and survey address the reasoning for EA measurement?	Yes/No
	Does the questionnaire and survey pose questions to the complexity of EA measurement?	Yes/No
	Does the questionnaire and survey address the main measurement tool (Balanced scorecard) which had been used for this research study?	Yes/No

3.5 Data collection

The data collection is significant to the research study as all data collected has to be efficient, feasible and practical for the type of research. Qualitative data findings develop from data collection being in-depth interviews, surveys and written documents (Yin, 2011:131; Babbie, 2009). The interview process is important in data collection as it assisted the researcher in attaining direct quotations from the participants experience in the field of EA, as well as behavioural actions of the organisation in terms of EA measurement. The open-ended interview questions allowed the researcher to identify and acquire the perspectives of the participants.

For this research study the following process had been followed:

Once the confirmation of an interview and an appointment had been allocated to the researcher, the interview questions had been circulated to the participants via email so that the participants can prepare themselves for the interview and if necessary other departmental experts could have also been brought forward for the interview in order to answer the questions which had been presented. In certain cases once the participants had read the interview questions based on their judgements, they had called upon key resources to assist in answering the questions. The participants requested to remain anonymous. The structured and unstructured sections of the interview questions were brought forward as a semi-structured in-depth interview. These types of interviews allows the interviewer a conversation with the interviewee, which is known to be worthwhile as the interviewer can then revert back to a structured interview when needed (Kvale, 1996; Eriksson & Kovalainen, 2008).

3.6 Data Reliability and Validity

The significance of research findings are categorised into data reliability and validity. Data reliability and validity are the main methods to ensure data integrity (Zikmund et al. 2012:463). Reliability in research is involved with the data collection techniques to ensure that data received is consistent (Bryman, 2012;169). Validity in research is involved in the findings of the research, whether or not they appear to be true (Bryman, 2012;171). In this research study, interview questionnaires were examined by experts in the field of EA before being distributed to the public and checked by the interviewee before completion of the interview.

3.7 Data analysis

The data analysis process creates a viewpoint out of the primary data which had been captured during interviews and surveys (Bryman & Bell, 2007; Bryman, 2012). Interviews were the main source of data collection which had assisted in answering the research questions. The interview questionnaire had been divided into six sections categorising and theming each section into a selected criteria for EA. The survey had been divided into three sections which were also categorised into themes for EA.

The practice of thematic analysis specifies the basic qualitative research study in such a way that it serves to identify recurring patterns in the form of themes. Thematic analysis tolerates a greater understanding and categorising of experiences which occurred during the interview process (Aronson, 1994). Thematic analysis outlines the importance of identifying evidence of a recurring theme (Bryman & Bell, 2007:637). The research questions presented in Chapter 1 have been motivated through the use of thematic analysis, as it allows the researcher to categorise recurring themes.

Data captured in the literature review, interviews and surveys have been analysed through the use of thematic analysis. **Table 7** outlines the themes and categories that were studied during the literature review, interviews and surveys.

Table 7: Outline of themes and categories

Themes	Categories
• EA implementation and the IT department • EA growth and influential factors • EA satisfaction • EA business case selection	The fundamentals of EA in an organisation.
• EA maturity	Determining the level of EA maturity in an organisation.
• EA measurement	Determining the value and types of EA measurement strategies for an organisation.

The themes and categories presented in **Table** 7 are fundamental in this research study which needed to be investigated through literature and focused on during the interviews and surveys.

3.8 Ethical considerations

Ethical considerations are required in qualitative research when an individual is involved through an interview or survey, whether be it direct or indirect involvement (Thomas, 2009:149).

Attached in Appendix A is the letter which had been given to the interviewees prior to the official meeting. Before the commencement of the interview, the research intentions were given to interviewees. The interviewees were also given the assurance that they could stop the interview at any time. Interviewees were informed that the answers from the interview will be given back to them before utilising the data in the research study to ensure that what was perceived and interpreted by the researcher is what they had intended to say. Individuals participating in the interview asked for their comments to remain confidential and anonymous. This assurance had been carefully observed throughout the research study.

3.9 Summary

This research chapter describes the diverse options which were used for the execution of the research study and the reasoning for selection of the specific methodology, approach and strategy, as well as the data collection, data reliability and validity, data analysis and ethical considerations which were used in this research study. In summary, the research study used the following methods:

- This research study is subjective based upon interpretivism.
- An inductive approach had been used in collaboration with an empirical approach.
- The data collection was attained through qualitative methods.
- The research strategy compromised of literature, interviews and surveys.
- Surveys and semi-structured interviews were the main form of data collection.

Chapter 4: Findings and Discussions

4.1 Introduction

Chapter 4 describes the data gathered through seven interviews and twenty surveys. Initially, a survey had been planned however due to the low response rate from the surveys it had forced the data collection method to include in-depth interviews by means of semi structured questionnaires. The qualitative research methods were used for data collection in order to evaluate EA, the challenges which impact EA and the influence of EA measurement on an EA strategy.

The interviews and surveys compromised of various theme sections. Themes were used to categorise the findings of the research. This is known as thematic analysis. The use of thematic analysis allows a better understanding and categorising of recurring themes (Bryman & Bell, 2007: 637).

Diagram 4 depicts the structure of Chapter 4.

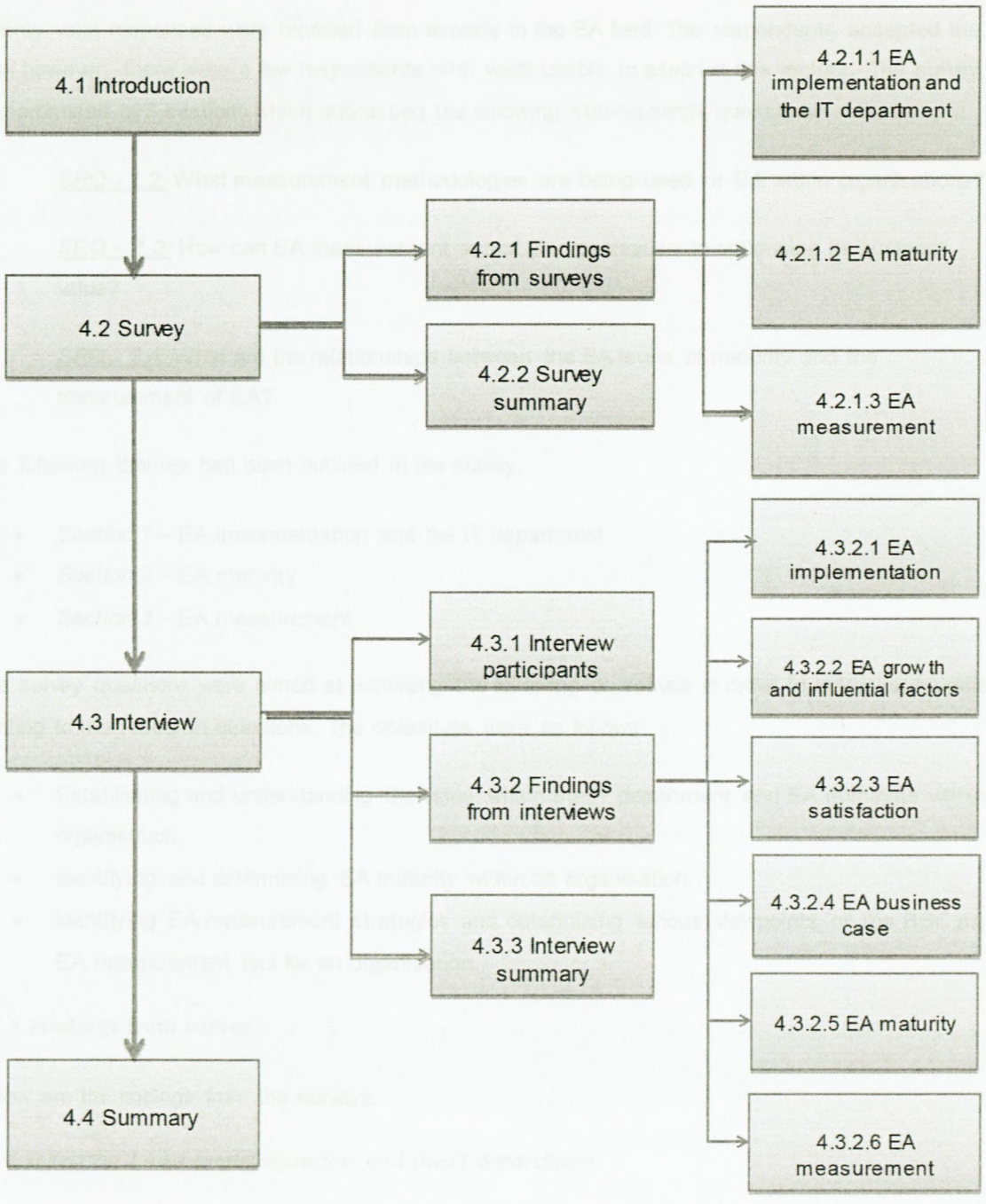


Diagram 4: Representation of Chapter 4.

4.2 Survey

Twenty valid responses were received from experts in the EA field. The respondents accepted the task however; there were a few respondents who were unable to assist in this venture. The survey compromised of 3 sections which addressed the following sub-research questions:

SRQ - 1.2: What measurement methodologies are being used for EA within organisations?

SRQ – 1.3: How can EA measurement assist an organisation in optimising its business value?

SRQ - 1.4: What are the relationships between the EA levels of maturity and the measurement of EA?

The following themes had been outlined in the survey.

- *Section 1* – EA implementation and the IT department
- *Section 2* – EA maturity
- *Section 3* – EA measurement

The survey questions were aimed at achieving the following objectives in order to extract summaries relating to the research questions. The objectives were as follows:

- Establishing and understanding the value which the IT department and EA dominate within an organisation.
- Identifying and determining EA maturity within an organisation.
- Identifying EA measurement strategies and determining various viewpoints on the BSC as an EA measurement tool for an organisation.

4.2.1 Findings from surveys

Below are the findings from the surveys.

4.2.1.1 Section 1 - EA implementation and the IT department

Section 1 is based upon choice selection questions which has its focus on the IT department and EA implementation.

Question 1 illustrated in **Table 8** serves to understand the importance of IT within an organisation.

Table 8: Summary of survey question 1

Theme	Survey Question	Respondents summary
EA implementation and the IT department	How significant is the IT department to the organisation?	All respondents had mentioned that the IT department is important to the organisation.

Question 2 illustrated in **Table 9** serves to identify the importance of the business needs to the IT department.

Table 9: Summary of survey question 2

Theme	Survey Question	Respondents summary
EA implementation and the IT department	How fundamental is business needs to the IT department?	Thirteen respondents mentioned that the business needs are "very important" to the organisation whereas seven respondents mentioned that the business needs are "average".

Question 3 illustrated in **Table 10** is a general question which serves to understand how well the organisation mitigates IT risks assuring that IT remains on top performance.

Table 10: Summary of survey question 3

Theme	Survey Question	Respondents summary
EA implementation and the IT department	How well does the organisation mitigate I.T risks and assuring that IT is on its top performance?	Twelve respondents mentioned that IT risk mitigation is "good" within their organisation assuming that the organisation looks into improving the risks which has or might occur, four respondents mentioned that the IT risk mitigation is "average" and the remaining four respondents have mentioned that IT risk mitigation is "bad".

Question 4 illustrated in **Table 11** serves to attain which of the organisations are using an EA framework.

Table 11: Summary of survey question 4

Theme	Survey Question	Respondents summary
EA implementation and the IT department	Does your organisation make use of any formal enterprise architecture framework?	An EA framework exists in eighteen of the respondents' organisations, whether be it at the initiation stage of development or at full maturity. Two respondents mentioned that currently they have no formal EA framework.

Question 5 illustrated in **Table 12** serves to understand the type of EA framework which is being used by the organisations.

Table 12: Summary of survey question 5

Theme	Survey Question	Respondents summary
EA implementation and the IT department	If yes answered to question 4, which framework does your organisation make use of?	Twelve respondents were using TOGAF as an EA framework, five respondents are using hybrid EA frameworks and only one of the respondents mentioned that their organisation is currently using the Zachman framework.

Question 6 illustrated in **Table 13** explains the respondents views on the complexity of EA to the levels allied with the implementation of EA.

Table 13: Summary of survey question 6

Theme	Survey Question	Respondents summary
EA implementation and the IT department	How complex was the implementation process of enterprise architecture within the organisation?	Question 6 has raised a concern as nine respondents mentioned that their EA implementation process had been "complex". Five respondents mentioned that the EA implementation process had been "moderate" assuming that there have been some difficulties which are being managed and six respondents mentioned that they are "uncertain" of the EA implementation process.

4.2.1.2 Section 2- EA maturity

Section 2 of the survey provides an indication of the maturity level within South African organisations at this point in time (2012). This is one of the important aspects for this study. The maturity of each organisation is assessed in a general format providing options for the respondents.

Question 7 illustrated in **Table 14** determines the involvement of executive management within the EA strategy.

Table 14: Summary of survey question 7

Theme	Survey Question	Respondents summary
EA maturity	How acquainted are executive managers with the enterprise architecture strategy?	Eleven respondents mentioned that executive management are not fully aware of the benefits which EA offers. Six respondents mentioned that executive management has some form of awareness of the EA strategy and the remaining four respondents left this question unanswered with no given reason.

Question 8 illustrated in **Table 15** determines the results which EA offers the organisation at this point in time (2012).

Table 15: Summary of survey question 8

Theme	Survey Question	Respondents summary
EA maturity	In terms of enterprise architecture maturity, describe the current results of the EA strategy within the organisation?	Question 8 describes the maturity of EA in terms of its progression within an organisation. Ten respondents have mentioned that EA has provided no results thus far, whereas eight respondents mentioned that EA has proven some results to the organisation. Two respondents left this question unanswered.

4.2.1.3 Section 3- EA measurement

Section 3 deals with EA measurement. These questions are purely to determine EA measurement within an organisation and how exactly the organisation establishes and partakes in EA measurement.

Question 9 illustrated in **Table 16** determines the respondent's perspective on EA measurement.

Table 16: Summary of survey question 9

Theme	Survey Question	Respondents summary
EA measurement	Does your organisation have any plans of implementing a measurement strategy for enterprise architecture?	Twelve respondents are planning on using EA measurement, whilst the remaining seven respondents are not planning on implementing EA measurement with no given reason. One of the respondents selected "maybe" as an option.

Question 10 illustrated in **Table 17** determines whether or not respondents/organisations realise the benefits and value of EA measurement.

Table 17: Summary of survey question 10

Theme	Survey Question	Respondents summary
EA measurement	With regards to enterprise architecture measurement, would you regard measurement to be beneficial?	Fifteen respondents showed a strong view that EA measurement would be beneficial the organisation. The reasoning behind EA measurement was not shared amongst all the respondents. The responses varied with the main responses being: • Measurement allows the ability to realise real-world benefits. • EA measurement could assist the EA framework. • Measurement can decide the value which EA delivers. Five respondents left this question unanswered with no given reason. This was an important question to determine the effect which EA measurement could have on the EA strategy.

Question 11 illustrated in **Table 18** determines if the BSC is an appropriate measurement tool for EA.

Table 18: Summary of survey question 11

Theme	Survey Question	Respondents summary
EA measurement	Would the balanced scorecard be a potential measurement tool for enterprise architecture?	Question 11 was based upon a choice selection question determining whether or not the BSC would be an appropriate EA measurement tool. Fifteen respondents mentioned that the BSC could be used as a measurement tool; three respondents said "no" it could not be used and two respondents said "maybe" it could be used.

4.2.2 Survey summary

The above questions have been posed to survey respondents gathering their IT department's importance to the EA strategy, EA maturity and EA measurement in order to determine where exactly EA is within South African organisations. The main problem areas from the surveyed organisations are listed as follows:

- Executive managers are unaware of the benefits which EA offers to an organisation.
- EA maturity is low in majority as a result of the EA strategy being complex.
- Majority of the organisations deemed EA measurement as a necessity, however EA measurement is hard to establish within the organisation.
- Majority of the respondents would use the BSC as an EA measurement tool.

4.3 Interviews

Interviews were conducted in a semi-structured approach. Themes had been developed for the interview process. The interview compromised of 6 sections which addressed the following research questions and sub-research questions:

Research Question – 1: What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?

> *SRQ - 1.1:* What are the factors which could influence the measuring of implementation and development within EA?
>
> *SRQ - 1.2:* What measurement methodologies are being used for EA within organisations?
>
> *SRQ – 1.3:* How can EA measurement assist an organisation in optimising its business value?
>
> *SRQ - 1.4:* What are the relationships between the EA levels of maturity and the measurement of EA?

From the research questions listed above the researcher developed various interview questions relating to each of the research questions whereby themes and objectives were established.

The themes were as follows:

- *Section 1* - EA implementation
- *Section 2* - EA growth and influential factors
- *Section 3* - EA satisfaction
- *Section 4* - EA business case
- *Section 5* - EA Maturity
- *Section 6* - EA measurement

The questions in the interview process were aimed at achieving the objectives in order to allow the researcher to extract summaries relating to the research questions and the sub-research questions. The objectives were as follows:

- Determining the EA level within the organisation in terms of EA frameworks; EA implementation and the enterprise architects success criteria.
- Identifying the key factors which could possibly influence the EA strategy.
- Determining and outlining EA factors which organisations are most and least satisfied with.
- Determining whether or not the organisation have/had used a business case, and if so what value metrics were used for EA.
- Identifying and determining the level of EA maturity within the organisation.
- Identifying and establishing the core elements of EA measurement as a success criterion for organisations. Determining the benefits which EA measurement could offer the organisation as well as determining viewpoints on the BSC as a potential measurement tool for EA.

The interview questions were significant for this research study as the researcher needed a direct explanation from the interviewee for the data collection process.

4.3.1 Interview participants

The interview participants were mainly specialists in EA as well as senior managers in the field of EA. The selection of interview participants was empirical to this study as the researcher needed the most appropriate and up to date responses.

4.3.2 Findings from Interviews

The researcher interviewed seven participants for this research study. All seven participants were aware of the types of questions before the conducting the interview. Due to the nature of these questions interviewees have requested to remain anonymous for themselves and for the organisation.

4.3.2.1 Section 1 – EA implementation

Question 1 illustrated in **Table 19** serves to identify whether or not the organisation has an existing EA framework.

Table 19: Summary of interview question 1

Theme	Interview Question	Interviewee summary
EA implementation	Does your organisation utilise a formal enterprise architecture framework?	Six of the interviewees organisations are currently using an EA framework, whereas only one of the interviewees have mentioned that their organisation has thus far no formal EA framework, however, the organisation has adopted and implemented the principles of EA by creating a hybrid EA framework.

Question 1a illustrated in **Table 20** serves to understand the type of EA framework which is being used by the organisations.

Table 20: Summary of interview question 1a

Theme	Interview Question	Interviewee summary
EA implementation	If "yes" answered to question 1, which specific enterprise architecture framework is being used?	Four organisations are currently using the TOGAF, two organisations are using the Zachman framework and the remaining interviewee has developed an in-house Hybrid framework to suit their specific business needs.

Question 2 illustrated in **Table 21** serves to identify the EA frameworks period of existence.

Table 21: Summary of interview question 2

Theme	Interview Question	Interviewee summary
EA implementation	If there is an existing enterprise architecture framework, how long ago had it been implemented?	Six of the organisations had their EA strategy running for over 3years, however one of the interviewees are still at the initiation and development stage of EA.

Question 3 illustrated in **Table 22** determines the downfalls which enterprise architects experience once EA has been implemented.

Table 22: Summary of interview question 3

Theme	Interview Question	Interviewee summary
EA implementation	Why are enterprise architects unable to realise the benefit s of enterprise architecture, once enterprise architecture has been initiated and implemented?	Three interviewees have mentioned that due to the lack of executive support and executive management co-operation, enterprise architects are losing track on EA implementation in such a way that EA is not being fully exploited within the enterprise. Three of the interviewees expressed dissimilar views mentioning that enterprise architects lose motivation due to EA frameworks that are unable to produce the necessary outcome as well as EA is not well understood before implementation. The remaining one interviewee mentioned that enterprise architects are far too theoretical and has to learn substantial methods in order to make EA more pragmatic and realistic.

4.3.2.2 Section 2 - EA growth and influential factors

Question 4 illustrated in **Table 23** assists in identifying various in-house factors which could possibly influence the implementation and development of EA.

Table 23: Summary of interview question 4

Theme	Interview Question	Interviewee summary
EA growth and influential factors for EA	What in-house factors could possibly affect the implementation and development of enterprise architecture within an organisation?	The interviewees had various perspectives regarding this question. The main concern was the lack of involvement from executive management. Some of the interviews mentioned that the business value of EA had not been articulated in the most appropriate manner and others mentioned that it's due to a lack of sponsorship and ownership.

Question 5 illustrated in **Table 24** relates to external factors which could affect the implementation and development of EA.

Table 24: Summary of interview question 5

Theme	Interview Question	Interviewee summary
EA growth and influential factors for EA	What external factors could possibly affect the implementation and development of enterprise architecture within an organisation?	Four of the interviewees mentioned that revenue and market risks are the main external factrs which affect EA within an organisation though; this perspective has not been shared amongst all of the interviewees. Two of the interviews shared dissimilar views, whereby technology shift becomes an external factor thus causing a change in customer behaviour. One of the interviewees disagreed and mentioned that EA should be internally driven thus having no EA external influential factors. The interpretations from the interviewees were dependent on the level of EA as well as their position within the organisation.

Question 6 illustrated in **Table 25** serves to identify important financial considerations for the implementation and development of EA.

Table 25: Summary of interview question 6

Theme	Interview Question	Interviewee summary
EA growth and influential factors for EA	From a financial perspective, what needs to be taken into consideration for the implementation and development of an enterprise architecture strategy?	Six of interviewees' main concern for this question was related to the budget as executive members need to accept and endorse EA within the organisation, in such a way that financial instruments such as ROI and TCO need to be used on order to show business value. Skilled resources and the selection of the most appropriate tools are often found to be expensive therefore the organisation has to outline its budget. The remaining interviewee has mentioned that the business case should be reviewed before an actual budget can be given to EA.

Question 7 illustrated in **Table 26** is aimed at gaining insights as to how readily available are EA resources are for executive members and for departments within the organisation in order for EA to receive recognition.

Table 26: Summary of interview question 7

Theme	Interview Question	Interviewee summary
EA growth and influential factors for EA	How readily available are the enterprise architecture resources?	This question raised a concern as three of the interviewees mentioned that their EA resources are unobtainable due to one of the following reasons: • EA being at initial stages of development. • Enterprise architects are not well equated with the EA program. • Costs of overheads are expensive for EA resources. One of the interviewees mentioned the EA resources are readily available to identify strategic initiatives and the remaining three interviewees' are unsure of their EA resources at this point in time.

Question 8 illustrated in **Table 27** is aimed at seeking what organisations would like to attain from EA.

Table 27: Summary of interview question 8

Theme	Interview Question	Interviewee summary
EA growth and influential factors for EA	What were the organisational goals for the enterprise architecture strategy?	Majority of the interviewees responses differed as each organisation has their own outcome. Alignment, cost reduction and better management of IT assets have been mentioned by four of the interviewees. IT Architecture is known to be implicit in the organisation however the organisation would like to attain an explicit strategy. One of the interviewees' would like to attain compliance with legislation and regulation, quick turnaround time, time to market and agility on products and service development.

4.3.2.3 Section 3 - EA satisfaction

Question 9 illustrated in **Table 28** is aimed at identifying EA characteristics which organisations are most satisfied with.

Table 28: Summary of interview question 9

Theme	Interview Question	Interviewee summary
EA satisfaction	What characteristics of enterprise architecture is the organisation most satisfied with?	The issue of alignment has been addressed by five of the interviewees' stating that EA has outlined suitable alignment for all business units, creating artefacts for business and IT alignment. One of the interviewees are satisfied with the way in which the information systems, information technology and governance is defined in TOGAF as well as the establishment of EA beginning to understand the importance of the business case for creating a strategic EA value. There had been one interviewee who responded vaguely to this question stating that there are none thus far.

Question 10 illustrated in **Table 29** is aimed at identifying EA characteristics which organisations are least satisfied with.

Table 29: Summary of interview question 10

Theme	Interview Question	Interviewee summary
EA satisfaction	What characteristics of enterprise architecture are the organisations dissatisfied with?	Four of the interviewees' have referred to their costing being too high as costs of licences and investments are costly for future development. Interviewees' are also unsatisfied with the lack of EA understanding, the lack of business buy-in and the lack of EA adoption. Two interviewees' left this question unanswered.

4.3.2.4 Section 4 – EA business case selection

Question 11 illustrated in **Table 30** serves to identify if any value metrics had been used for the business case of EA.

Table 30: Summary of interview question 11

Theme	Interview Question	Interviewee summary
EA business-case selection	Once the business case had been developed for enterprise architecture, was any value metrics used to assist the business case?	This question had been based upon choice selection. Six of the interviewees answered "YES" with a one interviewee answering "NO". Selecting a business case for EA can be regarded as important, however, some organisations have not used the business case for their EA.

Question 11a illustrated in **Table 31** serves to identify if any value metrics had been used for the business case of EA.

Table 31: Summary of interview question 11a

Theme	Interview Question	Interviewee summary
EA business-case selection	If "yes" answered to question 11, what value metrics had been used?	Question 11a was based upon a choice selection. The most popular value metric which had been used by organisations was "Business/strategy", "IT", "Financial" and "Risk and compliance" whereby majority of the interviewees selected those four. The remaining interviews varied between "Customer" and "Growth/Innovation."

4.3.2.5 Section 5 - EA maturity

Question 12 illustrated in **Table 32** serves to identify the maturity of organisations in terms of EA.

Table 32: Summary of interview question 12

Theme	Interview Question	Interviewee summary
EA maturity	How could enterprise architecture maturity be defined in your organisation?	Five of the interviewees have mentioned that EA maturity is relatively low due to a lack of measurement and a lack of cohesion. One of the interviewees mentioned that they are at level 1 of maturity as the EA framework is in place and had been implemented in a formal fashion. The remaining interviewee mentioned that their EA maturity is formal and effective as EA adds strategic value within the organisation.

Question 13 illustrated in **Table 33** addresses the maturity of EA within organisations.

Table 33: Summary of interview question 13

Theme	Interview Question	Interviewee summary
EA maturity	When would you consider enterprise architecture to have reached its matured state?	Five of the interviewees have mentioned that once EA can be measured in an appropriate manner would they then regard EA to have reached its matured state while the remaining responses all differed. One of the interviewees mentioned that once every manager relies on EA for their day-to-day analysis, another interviewee mentioned that once EA influences the business strategic agenda.

Question 14 illustrated in **Table 34** is aimed at achieving the critical success factors from organisations in order to achieve EA maturity.

Table 34: Summary of interview question 14

Theme	Interview Question	Interviewee summary
EA maturity	What could be regarded as critical success factors for achieving enterprise architecture maturity?	Business buy-in was the most important critical success factor as four of the interviewees mentioned "business buy-in" in their respective response to the question. Some of these interviewees mentioned that IT should not drive the initiative however a clear sponsor should be available while the other interviewees mentioned that alignment and proficient enterprise architects should demonstrate the business value from the EA process and EA engagements.

4.3.2.6 Section 6 – EA measurement

Question 15 illustrated in **Table 35** serves to identify the utilisation of EA measurement.

Table 35: Summary of interview question 15

Theme	Interview Question	Interviewee summary
EA measurement	Does your organisation have any plans of implementing a measurement strategy for enterprise architecture?	One of the interviewees have initiated a measurement strategy however, five of the interviewees have mentioned their organisation has thus far no measurement practices or procedures in place. The remaining interviewee had no response to this question as their EA is at the initial stage of development.

Question 15a illustrated in **Table 36** determines which strategy had been used for EA measurement.

Table 36: Summary of interview question 15a

Theme	Interview Question	Interviewee summary
EA measurement	If "yes" answered to question 15, what measurement strategy has been used?	Five of the interviewees are still unsure as to what measurement tool they would be using, however, there are plans to measure EA whilst one of the interviewees mentioned that they are using an internally defined score card with KPI tracking.

Question 15b illustrated in **Table 37** determines the reason as to why an EA measurement strategy had not been used.

Table 37: Summary of interview question 15b

Theme	Interview Question	Interviewee summary
EA measurement	If "no", why has no measurement strategy been used?	The interviewees who had answered "no" or unsure had mentioned that at this point in time EA measurement is found to be relatively complex due to the lack of EA understanding and the lack of EA maturity within the organisation.

Due to the disparate view from interviews, a bulleted list has been outlined for Question 16.

Question 16 illustrated in **Table 38** had been posed to determine whether or not EA measurement would be beneficial to an organisation.

Table 38: Summary of interview question 16

Theme	Interview Question	Interviewee summary
EA measurement	With regards to enterprise architecture measurement, would you regard measurement to be beneficial?	This is a fundamental question for this research study; therefore all the interviewee responses had been listed below. All of the interviewees had answered "yes" with various responses. The responses were as follows: • EA measurement assists in achieving EA maturity. • The fastest way to show value to executives. • EA Measurement would assist in helping the EA framework to reach maturity. • Assist with focusing on achieving ultimate objectives especially the ones related to competitor advantage and business satisfaction (Goals and objectives). • Without measurement you would not know if EA is delivering value. (i.e: what you do not measure cannot be managed). • With EA measurement, operational efficiency can be measured therefore strategy execution can be quantified better. • The benefits of EA are not derived directly and the effort towards EA maturity is costly. In this way, a method to assess the progressive realisation of direct and indirect value is essential.

Question 17 illustrated in **Table 39** serves to understand the benefits an organisation would like to achieve from EA measurement.

Table 39: Summary of interview question 17

Theme	Interview Question	Interviewee summary
EA measurement	What would you like to achieve from the measuring enterprise architecture strategy?	Five of the interviewees mentioned business and IT-alignment whilst one of the interviewees mentioned that it would be great to know that executive managers and business acknowledges the value of EA. Most of the interviewees would like to achieve an outcome to suit their organisations objective therefore some interviewees have also mentioned that through the use of EA measurement the organisation could monitor the progress against the business case mitigating risks and issues as well as improving of the business strategy by formulating its actual realisation and increasing its operational efficiency.

Question 18 illustrated in **Table 40** has been used to determine whether or not organisations would use the BSC as a potential EA measurement tool.

Table 40: Summary of interview question 18

Theme	Interview Question	Interviewee summary
EA measurement	Would the balanced scorecard be a potential measurement tool for enterprise architecture?	This is a fundamental question for this research study. Six of the interviewees had answered "yes" however one interviewee had disagreed to the BSC a measurement tool, with no given reason.

4.3.3 Interview summary

The above questions have been posed to various interviewees gathering their organisations EA implementation process, EA growth and influential factors, EA satisfaction, EA business case, EA maturity and EA measurement in order to gather information on where exactly their organisation is in terms of EA.

The main problems revolved around the following aspects:

- EA is unclear at the development stages as enterprise architects are not fully equipped with knowledge on EA and the business.
- In certain cases organisations are not benefiting from EA as EA has not reached its matured state.
- Organisations are unable to keep up with changes in customer behaviours, technology changes and the fluctuation of revenue and market risks.
- EA strategies lacked one of the following: Lack of executive management involvement, lack of trained EA staff, lack of measurement, lack of cohesion, lack of sponsorship and a lack of business buy-in.
- Organisations are in need of an EA measurement strategy however it is relatively complex. Organisations are also unsure of a measurement strategy which can be used to measure the value of EA to an organisation.

4.4 Summary

The data which had been collected in this research study has been presented throughout this chapter. Data gathered from the respondents and interviewees relates to the following aspects whereby themes had been established:

- EA implementation and the IT department
- EA satisfaction
- EA growth and influential factors
- EA business case selection
- EA maturity
- EA measurement

In summary to this section, EA maturity is found to be low in many organisations and organisations are also in need of an EA measurement strategy to guide the EA process.

A brief summary of the findings are presented in below:

1. Organisations would like to achieve business and IT-alignment; however the EA strategy seems to be very complex.
2. Enterprise architects are unable to achieve the desired goals and objectives from EA frameworks.
3. Executive management are unaware of EA benefits, thus causing a lack in business buy-in and sponsorship for the EA strategy.
4. In many situations, the EA budget allocation is inadequate.
5. Organisations would like to measure the effectiveness of EA; however, the measurement process is unclear and complex. Due to EA measurement being defined as complex, EA cannot reach a state of maturity.
6. Organisations would like to achieve business and IT-alignment from EA measurement; however this has not been achieved in many organisations relating to poor service delivery from staff and enterprise architects.
7. Organisations are depending on EA measurement to outline the level of EA maturity in order for executive management to realise the benefits which EA offers to an organisation.
8. The BSC has been regarded as potential EA measurement tool for organisations.

The data collected allows the researcher to gain a deeper understanding of EA maturity and EA measurement within the organisation, as well as the challenges which organisations are faced with during the implementation and development of EA. EA is relatively complex to initiate and develop in organisations, however few organisations have their EA strategy in order, this is due to appropriate planning and trained EA staff. The EA implementation, EA budget, executive management involvement, EA staff and EA measurement are of importance to the EA strategy. Through the use of EA measurement, executive managers are able make business decisions that support the EA strategy. As a result every EA strategy needs to be measured in order to determine its value to the organisation.

Chapter 5: Discussion of findings

5.1 Introduction

This chapter focuses on the discussion of findings presented in Chapter 4. The first section focuses on the research questions, sub-research questions and the discussions of findings. The response from interviews and surveys are summarised for an ease of presentation. A proposed integrated theoretical BSC/EA measurement scorecard is proposed followed by guidelines for enterprise architects and ending off with a summary.

Diagram 5 depicts the structure of Chapter 5.

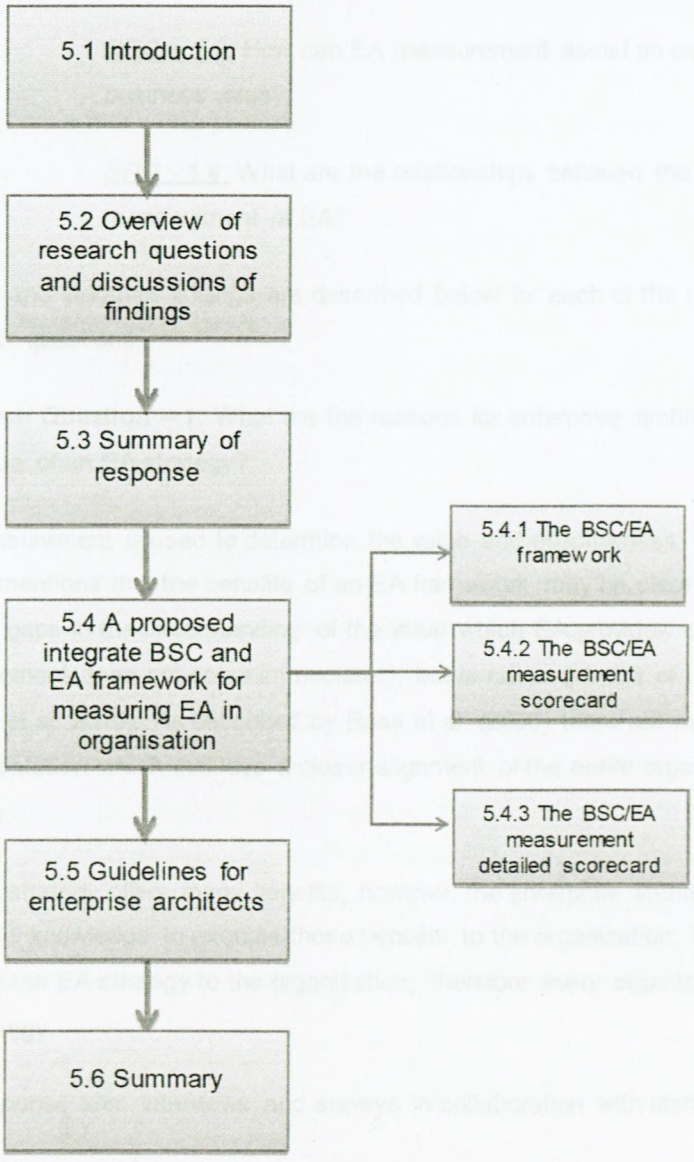


Diagram 5: Representation of Chapter 5.

5.2 Overview of research questions and discussions of findings

Below are the research questions and sub-research questions for this study.

Research Question – 1: What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?

SRQ - 1.1: What are the factors which could influence the measuring of implementation and development within EA?

SRQ - 1.2: What measurement methodologies are being used for EA within organisations?

SRQ – 1.3: How can EA measurement assist an organisation in optimising its business value?

SRQ - 1.4: What are the relationships between the EA levels of maturity and the measurement of EA?

Results and literature findings are described below for each of the research questions and sub-research questions.

Research Question – 1: What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?

EA measurement is used to determine the value and effectiveness of an EA strategy. Sessions (2007) mentions that the benefits of an EA framework may be clear to an organisation, however there may be gaps in the understanding of the value which EA provides once implemented. EA measurement does not occur immediately, but is rather a factor of the organised maturation process (Jahani et al. 2010). As described by Ross et al. (2006) there are many benefits from EA implementation which includes a closer alignment of the entire organisation with the business strategy.

The EA strategy offers many benefits, however the enterprise architect needs to be equipped with adequate knowledge to execute those benefits to the organisation. EA measurement defines the value of the EA strategy to the organisation; therefore every organisation is required to measure their EA strategy.

The response from interviews and surveys in collaboration with literature are presented in **Table 41**.

Table 41: MRQ – Response and literature

Key response	Literature
• EA measurement is complex. • Enterprise architects are unsure of an appropriate measurement strategy/tool to measure their EA strategy. • Lack of EA maturity causing EA measurement to be ineffective.	Townson (2011) mentions that enterprise architects are unable to measure the value and effectiveness of EA due to organisational complexity. Potts (2010) explains that enterprise architects should constantly measure the value of EA in order to enhance the performance of the EA strategy.

SRQ - 1.1: What are the factors which could influence the measuring of implementation and development within EA?

The factors which have influenced EA are as follows:

1. Inadequate EA budget.
2. Lack of involvement from executive management.
3. Unclear communication between shareholders, executive management and EA staff.
4. The business value of EA has not been understood prior to the implementation of the EA strategy.
5. Lack of strategic foundation.

The findings support that of Schekkerman (2004); Ross et al. (2006); Bonnet (2009) and Sanz and Glissman (2011) as majority of the interviewees and respondents mentioned that there is a lack in: executive management involvement, a poorly defined EA budget and unclear communication throughout the EA strategy. The result of this disallows organisations the ability to measure EA as the procedures are inappropriate for EA measurement. Another factor playing a role in measuring EA is the lack of understanding of the business value. The business value or lack thereof is a result of business and IT not understanding the value of EA to an organisation.

The response from interviews and surveys in collaboration with literature are presented in **Table 42**.

Table 42: SRQ – 1.1: Response and literature

Key response	Literature
Many of the respondents had mentioned that their EA budget has been insufficient.	Schekkerman (2004) elaborates on the importance of the EA budget. Many organisations attempt to implement an EA strategy but are not willing to invest time and a sufficient budget for the implementation or management of the EA strategy. The findings from the research support that of Schekkerman (2004) as the budget has been insufficiently allocated for the EA strategy thus causing a lack in EA maturity and EA measurement.
Strategic initiatives for EA should be available, thus adding value to the organisation and to the EA strategy.	The EA implementation and maturity process need to consider the technical and economical levels, which are also known as the economic aspect of an IT infrastructure. It is important to understand the business processes, in order to attain an appropriate strategic foundation for EA (Ross et al. 2006; Bonnet, 2009).
Executive management are unaware of the benefits which EA offers due to their lack of support and sponsorship.	For an EA strategy to provide business value the EA development and implementation process should be managed effectively and supported by tools (Schekkerman, 2006). Majority of IT systems are ruled by their own management technique, resulting in organisations having IT systems which are unreliable and imprecise with no added benefits to the organisation (Sanz & Glissman, 2011).

***SRQ - 1.2**: What measurement methodologies are being used for EA within organisations?*

Some organisations interviewed are measuring EA strategies. However, there were many organisations who had not even initiated an EA measurement strategy. This is because of the perceived EA measurement being complex and organisations being unaware of the type of measurement strategy to use. Organisations that currently have EA measurement strategies are using key performance indicators (KPI).

Potts (2010) explains the importance of EA measurement, stating that measuring EA can assist in determining the organisations strengths and weaknesses. Schekkerman (2006) developed an extended enterprise architecture scorecard (E2A) allowing organisations to measure the value of their EA strategy. The use of the E2A as a measurement tool is to determine the quality of the EA strategy. The E2A measurement scorecard is based upon 4 rows and 6 columns which focus on:

The rows are:

- Business – Expresses all business elements.
- Information – Explicit expressions of the information needs.
- Information systems – The support of specific functions.
- Technology infrastructure – The support of technology for information systems.

The columns are based upon questions of the:

- The contextual level (Why)
- The environmental level (With who)
- The conceptual level (What)
- The logical level (How)
- The physical level (With what)
- The transformation level (When)

Interviewees and respondents were asked about the BSC as a potential measurement strategy for EA. Majority of the responses are positive as to the BSC being a potential measurement strategy for EA. Schelp and Stutz (2007) developed a BSC/EA framework which allows organisations to measure their EA strategy. The framework allows for better decision making. The use of the BSC and EA framework links strategic goals into actions illustrating that resources are being used in the most appropriate manner. The framework has been divided into four categories which are based upon the BSC:

- Service developed from customer perspective.
- Processes developed from internal business perspective.
- Assets developed from learning and growth perspective.
- Finance developed from financial perspective.

The BSC/EA framework by Schelp and Stutz (2007) associates measurement directly with business strategies allowing organisations to determine the level of EA against the organisations business strategy.

SRQ – 1.3: *How can EA measurement assist an organisation in optimising its business value?*

Many examples (See bullet list below) have been giving by interviewees and respondents indicating that EA measurement could certainly increase the value of EA to an organisation as it could also assist in optimising its business value. The main responses were as follows:

- EA measurement assists in achieving EA maturity thus showing business value to executive management.
- Through the use of EA measurement organisations are able to achieve desired business objectives and goals as stipulated for the EA strategy.
- EA measurement assists in measuring operational efficiency of the EA strategy.
- Without measurement you would not know if EA is delivering value.
- EA measurement provides the fastest way to show value to business executives.

The findings of this study resonates closely with Schelp and Stutz (2007) that state the BSC/EA framework is useful for allowing organisations to measure their EA strategy in order to show value to executive members.

SRQ - 1.4: *What are the relationships between the EA levels of maturity and the measurement of EA?*

From the results received from interviews and surveys, EA maturity in organisations is deemed to be low at this point in time. Many reasons were given (see Chapter 4, Section 4.2 and Section 4.3). EA measurement is an important aspect which needs to be considered in order to achieve EA maturity within organisations. Organisations main concerns are to achieve tolerable business buy-in and business and IT-alignment. Organisations need to take EA measurement into consideration when implementing and developing the EA strategy.

EA maturity in accordance with EA measurement assists in the identification of standards for the EA strategy. The lack in EA measurement could possibly delay the success of the EA strategy (Ross et al. 2006; Weiss, 2006; Boucharas et al. 2010).

5.3 Summary of response

The research objectives have been based upon the research problem:

> *It is unclear how organisations that have implemented EA strategies, frameworks or methodologies measure the benefits and value of EA.*

The main research question has developed from the research problem. Stated below is the research question:

> *What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?*

In order to provide a rational answer for the research question and sub-research questions, a literature review, surveys and interviews had to be conducted to characterise the problems which organisations are facing with in terms of EA and EA measurement.

The data collected for this research study are based upon literature review, surveys and interviews. (See chapter 3, section 3.4). The final analyses are derived from the responses received through interviews and surveys. (Refer to chapter 4, Section 4.2 and Section 4.3 for more details). Illustrated in **Table 43** and **Table 44** is an analysis of the main responses which were gathered through interviews and surveys.

Table 43: Analysis of main responses highlighted by interviewees

Interview response
Response to question 1: TOGAF is the most common EA framework which is being used.
Response to question 2: Majority of the organisations EA frameworks has been running for over 3 years.
Response to question 3: According to the response, EA staff members are untrained with regards to the process and procedures involved in EA. It has also been noted that there is a lack of executive management support to the EA program.
Response to question 4: The main internal factors which affects EA is due to the lack of EA understanding, lack of sponsorship and lack of support from executive management.
Response to question 5: Revenue and market risks were the main external influences outlined by interviewees, followed by technology advancement which could possibly affect the EA strategy.
Response to question 6: The EA budget is the biggest dilemma which organisations are faced with when implementing and developing an EA strategy.
Response to question 7: EA resources are inaccessible in majority of the interviewed organisations.

Response to question 8: Majority of the interviewees stated they their organisation would like to achieve business and IT-alignment, cost-reduction, better management of IT assets and quick turnaround time through the use of EA, thus adding value to IT.
Response to question 9: Organisations are satisfied with the business and IT-alignment which EA offers, however, achieving accurate business and IT alignment could be complex.
Response to question 10: Majority of organisations are dissatisfied with their EA strategy due to lack of EA planning and a lack of EA knowledge.
Response to question 11: Majority of organisations who had been interviewed utilises a business case with the most common business case being: • Business/strategy • IT • Financial
Response to question 12: EA maturity is low in many of the organisations mainly due to lack of measurement.
Response to question 13: Interviewees would regard EA maturity to have reached its matured state once EA can be measured in the most suitable manner, by giving the business and executive management an outline of where exactly EA is in terms of maturity.
Response to question 14: Business buy-in and a clear sponsorship had been stated as important critical success factor for EA.
Response to question 15: Majority of the organisations are planning to measure their EA strategy, whereas some has already measured their EA strategy and others are still in the process of measuring EA. However, EA measurement is considered to be complex.
Response to question 16: Interviewees stated that EA measurement would be beneficial to the organisation and to the EA strategy.

Response to question 17: Organisations would like to achieve business and IT-alignment as well as executive managers to realise the benefits which EA offers. According to the response, organisations would prefer having an EA measurement strategy.
Response to question 18: The BSC has been considered by various interviewees to be a potentially measurement tool for EA.

Table 44: Analysis of the main responses highlighted by the respondents of the surveys

Survey responses
Response to question 1: From the response given by respondents, the IT department is viewed to be important to an organisation for its day-to-day operation.
Response to question 2: The IT department is valuable to an organisation, therefore business needs has to be taken into consideration before any development can commence within the IT department.
Response to question 3: Majority of the organisations are able to mitigate IT risks.
Response to question 4: Majority of organisations are currently using an EA framework.
Response to question 5: TOGAF is the most popular EA framework.
Response to question 6: The EA implementation process was said to have been complex by many respondents.
Response to question 7: Executive members are unaware of the benefits which EA offers.
Response to question 8: The level of maturity for EA within organisations thus far can be assumed as poor as majority of organisations are not utilising EA to its full capability.
Response to question 9: Majority of organisations are planning on utilising an EA measurement strategy, though it appears as if organisations are uncertain on a measurement strategy.

Response to question 10: All the respondents have mentioned that EA measurement would be beneficial due to various reasons stated.
Response to question 11: The BSC could be presumed as a potential measurement tool.

Through the use of the **Table 43** and **Table 44** the outputs of the findings (see chapter 4) can be documented in a summary format. The outputs of the findings are:

1. Organisations in this research study are not fully aware of the benefits which EA offers.
2. The organisations do not effectively measure the benefits and value that EA strategies and implementations offer.
3. EA maturity is deemed to be low in many of the organisations. This is due to a lack of measurement and cohesion.
4. The lack of EA measurement develops from enterprise architects being unable to determine which measurement strategy to utilise.
5. The complexities which are perceived from the EA strategy are also making measurement difficult for the enterprise architect.
6. The lack of training employees on EA implementation also contributes towards the non-measurement of EA.
7. The lack of change management during the implementation process makes measurement of EA challenging.

5.4 A proposed integrated BSC and EA framework for measuring EA in organisations

This section provides a BSC/EA measurement scorecard for organisations. The BSC/EA measurement scorecard is proposed for EA measurement within an organisation.

From the seminal work of Schekkerman (2006) and Schelp and Stutz (2007) a proposed theoretical BSC/EA measurement scorecard was developed outlining the important aspects within their EA measurement strategy and combining those aspects into the proposed BSC/EA measurement scorecard. Schelp and Stutz (2007) show executive managers that resources are being used in the most efficient manner whereas Scheckkerman (2006) main objective is to determine the status of the addressed topics in terms of the original EA scope as well as determining the quality of the EA strategy.

The BSC/EA measurement scorecard is aimed at addressing the following aspects:

The business aspect:

- Business vision, goals and objectives
- Business strategies
- Business benefits
- Business processes
- Business activities

The IT aspect:

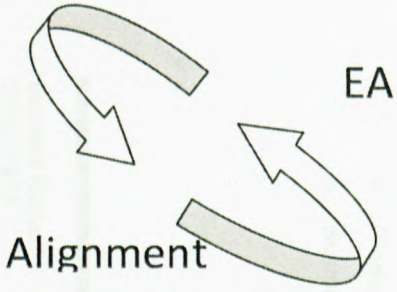
- Information systems
- IT strategies
- IT goals and objectives
- IT governance
- IT project management
- IT risk
- IT budget

The BSC/EA measurement scorecard allows organisations to measure the benefits and value of EA. Through the use of these benefits and values organisations are able to make sufficient long term decisions.

5.4.1 The EA alignment framework

The EA alignment framework has been adapted on the literature and in-depth discussions with the original author for a study that had been conducted at the same time as this study (de la Harpe & Mtongana, 2012).

Table 45: The EA alignment framework (de la Harpe & Mtongana, 2012)



	IT	IS	BP	BB	BS	BV
	Requires IT infrastructure as well as methodologies and must be undertaken specifically with the business needs in mind, at the level of the	The IS must support the BP and the management is responsible for carrying out their mandate	The BP that is most crucial to the success of the business.	BS need to generate the BB that are sought	Business strategy is formulated with specific regard to support the vision goals and objectives of the business	Guides the business on a day to day as well as the future basis
Formulation of business strategy Business strategy is formulated with specific regard to the benefits that are sought, and the processes that are most crucial to the success of the business	IT management ensures that IT is used well, so that strategies could be dealt with technology supply as component.	IS reflects the business by its operation and what it does.	BP delivers useful things to the organisations and therefore sums up all the effort that goes into delivery of the results.	Benefits could generate a certain amount of net profit that could be shared among the various organisations /	BS accommodates the potential benefits of IT and extending from an understanding of base technologies that are used.	Each business has its own vision, goals and objectives.
Implementation Planning Implementation is concerned with who does what & how. In the matter of information systems, this requires IT acquisition, project planning and business change management	IT determines what is required (IT acquisition), how should be achieved (project planning) and what is expected by the business (change management).	Implementation and delivery of the new systems will be determined by a strategy, which is responsible for the benefits that would be	BP delivers an output to organisational stakeholders after the business activities have taken place.	The negotiated benefits would be delivered by the deployed IS, whether through investment or less real outcomes.	The business strategy directs the high level instructions as objectives expected by the key stakeholders.	Business vision and goals will become achievable because of aligned instructions.
Information systems analysis and design Systems analysis, design and implementation requires IT infrastructure and must be undertaken specifically with the business needs in mind, at the level of the business	IT use a method for the defined set of analysis activities and techniques to deliver IS solutions in a manageable way.	The plans for the business and its development should be established with the demands for the aligned new	Analysis undertaken to determines into detail the business process at higher and lower levels of IS strategies.	Benefits in IS requiring corporate governance for managing the relations between shareholders & business performance.	Business changes and stakeholder impact are identified and analysed.	IS does collection of activities that delivers output through business and IT alignment.
Operations Research and Project Management Project Management can extend over the whole spectrum, or it can be combined with or within the silos as given or between departments and divisions	IT determines how applications will be delivered, how technology and resources will be required, used, monitored & managed.	The commitment of business management and involved staff need to be supported by	The project activities and map benefits to the projects deliver the enabling changes.	Types of benefits are determined and how they will be measured.	Project management produces business benefits that represent the	Organisations responsible for process management and business performance

5.4.2 The BSC/EA measurement scorecard

Through the use of the BSC by Kaplan and Norton (1996), the E2A by Schekkerman (2006), the BSC/EA framework by Schelp and Stutz (2007) and the EA alignment framework by de la Harpe & Mtongana (2012). A BSC/EA measurement scorecard is proposed to measure the benefits and value of EA in an organisation.

According to Kaplan and Norton (1996) the BSC (see Chapter 2, Section 2.7) has four domains, namely:

- Financial – How do we generate value for our shareholders?
- Customer – How do we create value? What benefits do we need to provide?
- Internal business processes – To satisfy customers at what business processes must we excel?
- Learning and growth – How will we sustain our ability to change and improve?

The proposed BSC/EA measurement scorecard is based upon these four domains with various sections within each quadrant of the BSC. Below are the four domains in collaboration with the EA alignment framework (**Table 45**) and the questions which were derived upon for the BSC/EA measurement scorecard from each section within the EA alignment framework and the BSC.

Domain #1: Financial

- **IT uses a method for the defined set of analysis activities and techniques to deliver It solutions in a manageable way**
  1. There is a method in the organisation to delivering IT solutions
  2. IT solutions are delivered in time
  3. IT solutions are delivered within budget
  4. IT solutions deliver quality artifacts

- **Benefits in IT requiring corporate governance for managing the relations between shareholders & business performance**
  1. Business understand the need for IT governance
  2. IT understand the need for IT governance
  3. IT follows a governance protocol
  4. IT understands the benefits that governance can offer the shareholders
  5. Business understands the benefits that governance can offer the shareholders

- **Business changes and stakeholder impact are identified and analysed**
  1. IT identifies business changes when executing their mandate
  2. IT drives business change
  3. IT analyse business processes in order to evaluate the impact and risk of the proposed changes
  4. Business communicates the changes IT proposes to the business processes
  5. IT is involved in the change management processes
  6. There is a change management strategy in place

Domain #2: Customer

- **Benefits could generate a certain amount of net profit that could be shared among the various organisations / departments**
  1. There are IT strategies in place to generate benefits for the company
  2. IT knows the benefits that they can offer the business
  3. IT monitors the benefits they have to deliver to business
  4. All business processes are geared towards obtaining the benefits
  5. The systems that support the business processes is designed in such a way to support the creation of benefits

- **At implementation, IT determines what is required, how to achieve it, what is expected by the business (including change management)**
  1. IT has a specific methodology to determine what is required for implementation
  2. IT has specific methodologies to achieve their goals?
  3. It knows what the business expects
  4. IT has regular meetings with business to manage business expectations
  5. Business prioritise IT projects
  6. There is a change management culture in the organisation
  7. There is a change management program in the organisation
  8. IT is part of the change management program in the business
  9. There is a communication program within IT on how and when to communicate to business

- **BP delivers an output to organisational stakeholders after the business activities took place**
  1. Organisational stakeholders benefit from the business processes
  2. All business process delivers useful outputs

- **The business strategy directs the high level instructions as objectives expected by the key stakeholders**
  1. The business strategies are clear and easy to understand
  2. The company goals and objectives are in line with the business strategies

- **The negotiated benefits would be delivered by the deployed IT, whether through investment or less real outcomes**
  1. The desired benefits are as a result of the deployed IT systems

- **IS does collection of activities that delivers output through Business and IT alignment.**
  1. Business and IT alignment is important in order to deliver the required output
  2. IT measures alignment between business and IT
  3. IT collects all activities that delivers on the output for business and IT alignment

Domain #3: Internal business processes

- **IT management ensures that IT is used well, so that strategies could be dealt with technology supply as component**
  1. IT understand the business strategies
  2. IT has the infrastructure (hardware/software) to support the business needs
  3. IT knows the critical business processes
  4. IT understands the critical business processes
  5. IT has the infrastructure (hardware/software) to support the business processes

- **IS reflects the business by its operations and what it does**
  1. There is a comprehensive IS strategy
  2. When asking information about the business (for example customers) all employees will get the same answer from the IT
  3. Employees trust the information received from IT
  4. There is an accountable person for information
  5. Management understands what data quality is
  6. Management is committed to quality data

- **BS accommodates the potential benefits of IT and extending from an understanding of base technologies that are used**
  1. Business understands the potential benefits IT offers the business
  2. Business understands the base technologies to their disposal

- **Each business has its own vision, goals and objectives**
  1. The vision goals and objectives are clearly communicated to IT
  2. IT contributes towards the vision, goals and objectives of the business
  3. IT has its own vision goals and objectives?
  4. The vision , goals and objectives of IT supports and are in line with the overall business vision, goals and objectives

- **Implementation, delivery of systems are determined by strategy, bringing benefits**
  1. There is a company implementation process
  2. There is a company IT delivery process
  3. There is a IT strategy for IT implementation in place
  4. There is a IT strategy for IT delivery in place
  5. All implementation and delivery strategies and processes are beneficial towards the company's vision and goals

- **Analysis undertaken to determine in detail the business process at higher and lower levels of IT strategies**
  1. IT strategies are linked to business processes
  2. Analysis are done in detail on business processes
  3. IT understand the business processes
  4. Every business process is linked to a system

- **IT determines how applications will be delivered, how technology and resources will be required, used, monitored & managed**
  1. Business has no say over how applications are delivered
  2. Business has no say over technology
  3. Business has no say over resources in IT
  4. Business has no say over how IT uses, monitor and/or manages its applications

- **The commitment of business management and involved staff need to be supported by strategic IT**
  1. Business management is committed to supporting the IT strategies
  2. The employees of the organisation is committed to support IT strategies
  3. The organisation as a whole knows and understand IT strategies

- **Types of benefits are determined and how they will be measured**
  1. The benefits that business processes offer are determined
  2. The benefits that business processes offer are measured

Domain #4: Learning and growth

- **BP delivers useful things to the organisation and therefore sums up all the effort that goes into delivery of results**
  1. All business processes are mapped
  2. There is a system for every single process
  3. All business processes are designed to contribute towards the company's goals and objectives
  4. There are strategies in place for continues quality improvement of business processes

- **Business vision and goals will become achievable because of aligned instructions**
  1. The business vision is clearly articulated to IT
  2. The business goals are clearly articulated to IT
  3. The instructions from business to IT is clear and easy to understand
  4. The instructions from business to IT is aligned with the Business vision and goals

- **The plans for the business and its development should be established with the demands for the aligned new systems**
  1. IT is always aligning systems to business plans and development
  2. IT is always aligning systems to business strategies and needs
  3. New systems are always aligned with business plans and goals

- **The project activities and map benefits to the projects deliver the enabling changes**
  1. Project activities are mapped to the benefits of what the project must deliver
  2. Project activities includes the change management process

- **Project management produces business benefits that represent the fulfilment of strategy**
  1. Project management produces the required benefits
  2. Project management is aligned with the strategies of IT
  3. Project management is aligned with the business strategies

- **Organisations responsible for process management and business performance delivery**
  1. The organisation takes responsibility for business process management
  2. IT takes responsibility for business process management
  3. IT takes responsibility for business performance delivery
  4. The organisation takes responsibility for business performance delivery
  5. IT is involved in business strategic planning
  6. IT is involved in the business budgetary process

The BSC/EA measurement scorecard (Appendix C, as an example) can be used as measurement tool to establish the benefits and value of EA to the organisation. It can be done by answering the questions, with the goals and objectives of the EA strategy in mind. The questions addressed in the EA measurement scorecard Appendix C will be based upon a Likert scale which needs to be answered in the respective columns *"1 - 7"*. Each question has a specific weight depending on its importance.

Guidelines for completion of the BSC/EA measurement scorecard:

1. All answers need to be filled in the respective columns by using numbers 1 – 7.
    a. 1 – Disagree very strongly
    b. 2 – Disagree strongly
    c. 3 – Disagree
    d. 4 – Uncertain
    e. 5 – Agree
    f. 6 – Agree strongly
    g. 7 – Agree very strongly
2. No letters will be accepted within the respective columns.
3. The scorecard calculates the total, which then gets displayed in the BSC/EA measurement detailed scorecard (**Table 46**).

These guidelines should strictly be followed at all times whilst completing the BSC/EA measurement scorecard.

5.4.3 The BSC/EA measurement detailed scorecard

The BSC/EA measurement detailed scorecard is a complete summary of the BSC/EA measurement scorecard (Appendix C) with a column for the respective score of each section.

Once BSC/EA measurement scorecard (Appendix C) is completed, the BSC/EA measurement detailed scorecard acquires a score (%) and a specific colour/Icon depending on the score. Below (**Table 46**) is an example of the completed BSC/EA measurement detailed scorecard.

1. The scorecard has a lowest and a highest value, which are:
   Highest value – 100%
   Lowest value – 0%
2. The framework has 4 colours which indicates the level of EA within the specific area:
   - Black – Very bad (The organisation needs to relook at the entire EA strategy)
     <= 30%
   - Red – Bad (The EA strategy needs adequate implementation and development)
     >= 30% and <= 50%
   - Amber – Average (The EA strategy provides some resources to the organisation)
     > 50% and <= 75%
   - Green – Very Good (The EA strategy is measurable which provides adequate resources to the organisation as well as to executive management for decision making)
     >= 75% and <=100%

Through the use of the BSC/EA measurement detailed scorecard, organisations are able to distinguish their benefits and value of the EA strategy. By using the BSC/EA measurement scorecard organisations are also able to determine where improvements are needed.

Table 46: The BSC/EA measurement detailed scorecard example

	IT	IS	BP	BB	BS	BV
EA alignment	Requires IT infrastructure as well as methodologies and must be undertaken specifically with the business needs in mind, at the level of the business process	The IS must support the BP and the management responsible for carrying out their mandate	The BP that is most crucial to the success of the business.	BS need to generate the BB that are sought	Business strategy is formulated with specific regard to support the vision goals and objectives of the business	Guides the business on a day to day as well as the future basis
Formulation of business strategy - Business strategy is formulated with specific regard to the benefits that are sought, and the processes that are most crucial to the success of the business	IT management ensures that IT is used well, so that strategies could be dealt with technology supply	IS reflects the business by its operation and what it does.	BP delivers useful things to the organisations and therefore sums up all the effort that goes into delivery of the results.	Benefits could generate a certain amount of net profit that could be shared among the various organisations / departments.	BS accommodates the potential benefits of IT and extending from an understanding of base technologies that are used.	Each business has its own vision, goals and objectives.
Score	61%	39%	72%	62%	71%	40%
Implementation Planning - Implementation is concerned with who does what & how. In the matter of information systems, this requires IT acquisition, project planning and business change management	IT determines what is required (IT acquisition), how should be achieved (project planning) and what is expected by the business (change management).	Implementation and delivery of the new systems will be determined by a strategy, which is responsible for the benefits that would be brought.	BP delivers an output to organisational stakeholders after the business activities have taken place.	The negotiated benefits would be delivered by the deployed IS, whether through investment or less real outcomes.	The business strategy directs the high level instructions as objectives expected by the key stakeholders	Business vision and goals will become achievable because of aligned instructions.
Score	43%	25%	100%	71%	43%	23%
Information systems analysis and design - Systems analysis, design and implementation requires IT infrastructure and must be undertaken specifically with the business needs in mind, at the level of the business process	IT use a method for the defined set of analysis activities and techniques to deliver IS solutions in a manageable way.	The plans for the business and its development should be established with the demands for the aligned new systems.	Analysis undertaken to determines into detail the business process at higher and lower levels of IS strategies.	Benefits in IS requiring corporate governance for managing the relations between shareholders & business performance.	Business changes and stakeholder impact are identified and analysed.	IS does collection of activities that delivers output through Business and IT alignment.
Score	80%	23%	18%	45%	50%	43%
Operations Research and Project Management - Project Management can extend over the whole spectrum, or it can be combined with or within the silos as given or between departments and divisions	IT determines how applications will be delivered, how technology and resources will be required, used, monitored & managed.	The commitment of business management and involved staff need to be supported by strategic IS.	The project activities and map benefits to the projects deliver the enabling changes.	Types of benefits are determined and how they will be measured.	Project management produces business benefits that represent the fulfilment of strategy.	Organisations responsible for process management and business performance delivery.
Score	64%	81%	46%	29%	64%	50%

5.5 Guidelines for enterprise architects

The following guidelines (Level 1, 2, 3) have been developed for enterprise architects who are required to measure their organisations EA strategy. The guidelines are described in **Figure 13**:

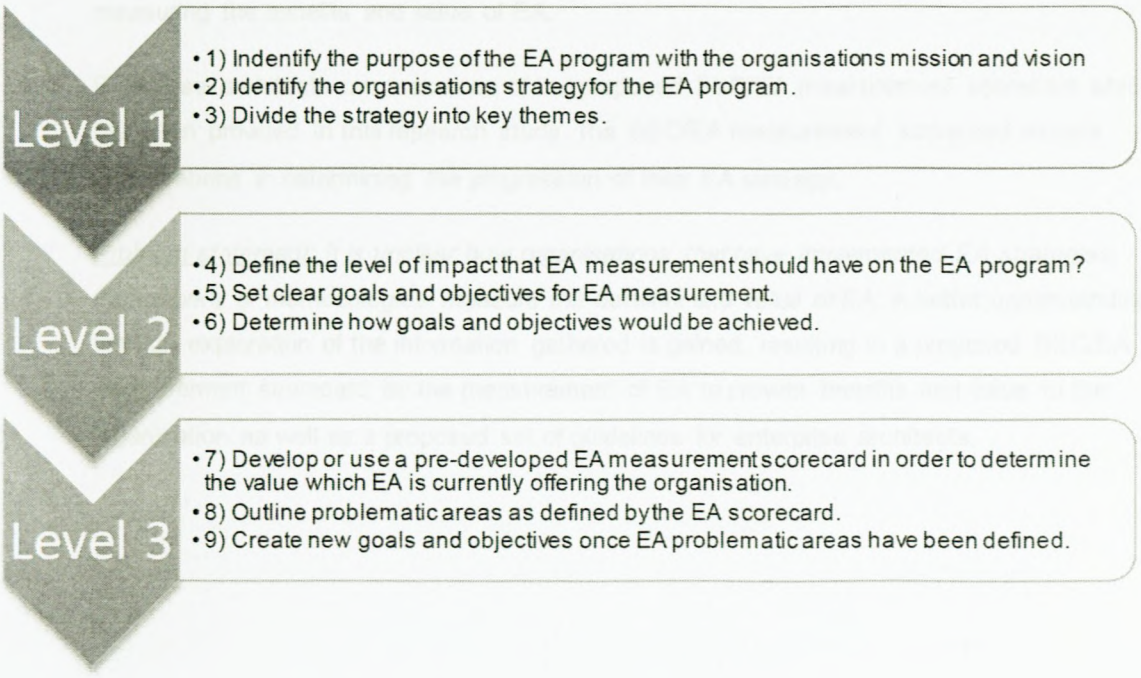


Figure 13: EA measurement guidelines for enterprise architects.

The objective of EA is to assist organisations in business and IT-alignment therefore appropriate procedures should be carried out before the initiation of EA. Through the use of these guidelines presented above, organisations and enterprise architects are able to outline the possible downfalls in the EA strategy.

5.6 Conclusion

This chapter provides a discussion of the findings. The chapter initiated with an introduction, discussion of findings thereafter providing a table with analysis of the main responses from respondents (interviews and surveys), a proposed BSC/EA measurement scorecard for measuring EA and lastly guidelines for enterprise architects. It is concluded that for the organisations interviewed and surveyed, the measurement of EA is still a challenge. The proposed guidelines for enterprise architects and the BSC/EA measurement scorecard is an attempt to give some order in this complex field.

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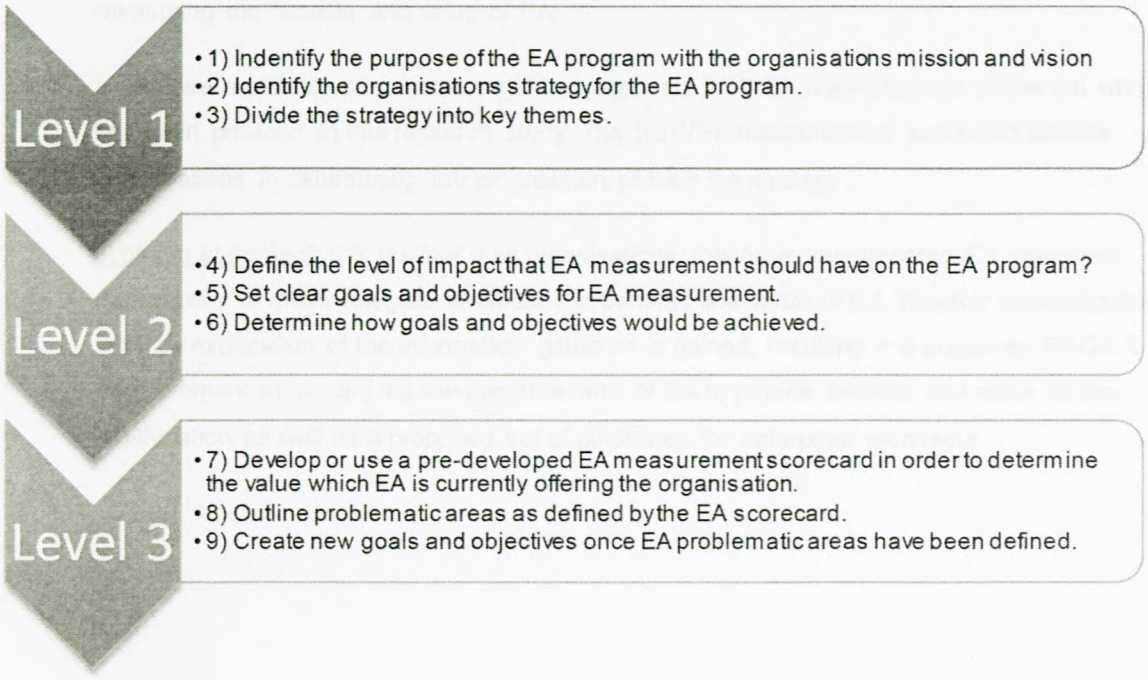

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In conclusion to the research question and problem statement:

Research Question: *What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?* The research showed that the complex environment and the lack of measuring strategies/tools are to be the main reason for enterprise architects not measuring the benefits and value of EA.

Enterprise architects can make use of the proposed BSC/EA measurement scorecard which has been provided in this research study. The BSC/EA measurement scorecard assists organisations in determining the progression of their EA strategy.

Problem statement: *It is unclear how organisations that have implemented EA strategies, frameworks or methodologies measure the benefits and value of EA.* A better understanding through exploration of the information gathered is gained, resulting in a proposed BSC/EA measurement scorecard for the measurement of EA to provide benefits and value to the organisation as well as a proposed set of guidelines for enterprise architects.

Chapter 6: Conclusion and reflection

6.1 Introduction

The purpose of this study was to investigate EA measurement within organisations. This study initiated after Bonnet (2009) who mentions that minimal guidance has been given to EA measurement within organisations. A literature study has been done to understand the value of EA and EA measurement in organisations. The results of this study show that adopting EA measurement in organisations is beneficial in many ways, such as:

- Achieving business and IT-alignment.
- Executive management and business managers can acknowledge the benefits and value of EA to an organisation.
- EA measurement allows organisations to monitor the EA strategy, thus mitigating any risks involved.
- EA measurement assists in achieving EA maturity.
- EA value can be realised through the use of EA measurement.
- EA measurement can be used as a guideline for future EA and business decisions.

This is in support of Jahani et al. (2010) and Potts (2010) whereby they have mentioned that EA measurement assists in determining the value of EA to an organisation.

From the analysis done thus far, the BSC can assist in measuring an organisations EA strategy. The use of the BSC as a measurement tool gives the organisation a holistic view of the EA strategy. From the data gathered in this research study, the BSC is well-known in many organisations. Organisations are prepared to use the BSC as a measurement tool for EA, however minimal work has been done on the BSC in collaboration with EA as a measurement tool. Through the use of measuring EA with the guidelines of the BSC, executive managers and enterprise architects are able to make long term decisions which can also affect the long term performance of the organisation.

The results of the interviews and surveys have shown that the BSC could be used as part of a measurement strategy, thus the combination of the BSC/EA measurement scorecard could assist in the performance of an organisations EA strategy.

The problem statement and the research questions are revisited in **Section 6.2**. This chapter concludes with suggestions for future research and a conclusion of the research study.

Diagram 6 depicts the structure of Chapter 6.

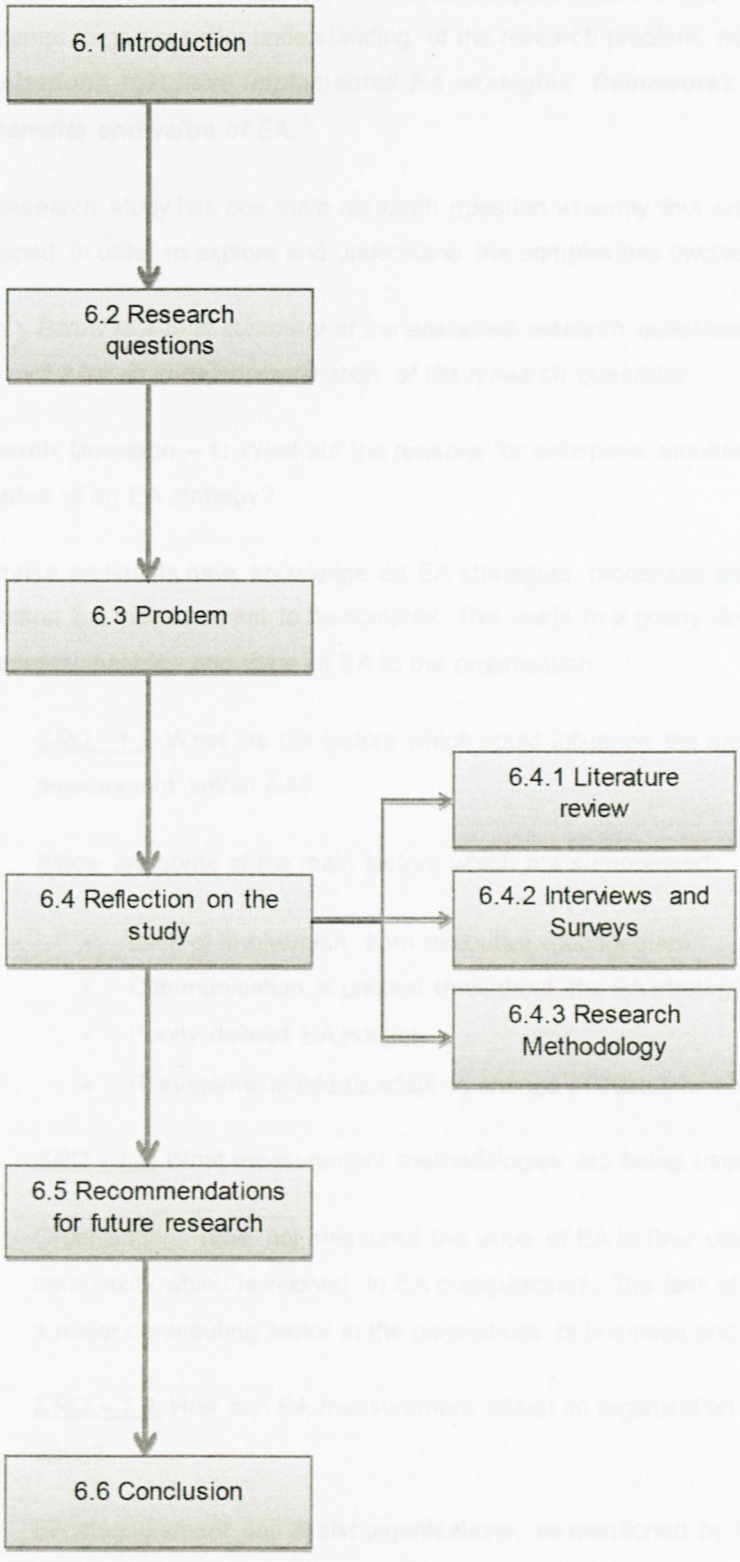

Diagram 6: Representation of Chapter 6.

6.2 The research questions

This section provides a rundown of the research questions. The literature and findings were used in an attempt to gain a better understanding of the research problem, namely: ***"It is unclear how organisations that have implemented EA strategies, frameworks or methodologies measure the benefits and value of EA."***

This research study has one main research question whereby four sub-research questions have been developed in order to explore and understand the complexities involved in EA measurement.

Below is a brief summary of the answered research questions. Refer to Chapter 5, Section 5.2 for an in-depth explanation of the research questions.

Research Question – 1: What are the reasons for enterprise architects not measuring the benefits and value of an EA strategy?

Enterprise architects have knowledge on EA strategies, processes and procedures. However, they are finding EA measurement to be complex. This leads to a poorly designed EA strategy with no fundamental benefits and value of EA to the organisation.

SRQ - 1.1: What are the factors which could influence the measuring of implementation and development within EA?

Below are some of the main factors which are summarised:

- Lack of involvement from executive management.
- Communication is unclear throughout the EA strategy.
- Poorly defined EA budget.
- IT systems unable to adapt to change in customer behaviour.

SRQ - 1.2: What measurement methodologies are being used for EA within organisations?

Organisations have not measured the value of EA to their organisation. This is due to the complexity which is involved in EA measurement. The lack of EA measurement seems to be a major contributing factor in the perceptions of business and IT.

SRQ – 1.3: How can EA measurement assist an organisation in optimising its business value?

EA measurement can assist organisations, as mentioned by interviewees and respondents to achieve business and IT-alignment as well as to show business value through the use of EA.

SRQ - 1.4: What are the relationships between the EA levels of maturity and the measurement of EA?

The relationship between EA maturity and EA measurement have been regarded as low due to the complexities which are involved in measuring EA, therefore EA measurement has not been accomplished in many organisations causing the EA strategy to show no benefits and value.

6.3 Problem

EA measurement is complex in many organisations due to the lack of guidelines or methodologies for enterprise architects. This research study proposes a set of guidelines (see **Figure 13**) for EA measurement. This is an attempt to address as many EA aspects as possible in order for the EA strategy to become more effective in organisations.

Through the use of these guidelines, enterprise architects are able to determine the downfalls and problems which may occur during the implementation and development of EA. Once implemented, enterprise architects should focus on measuring the benefits and value of the EA strategy to the organisation.

6.4 Reflection on the study

This section is twofold: It reflects upon the data which had been collected through literature, surveys and interviews as well as the research methodology which had been followed with reference to this research study.

6.4.1 Literature review

Marshell and Rossman (2011:78) state that the literature review describes assumptions which can be used to answer various research questions showing that the researcher is knowledgeable about a specific research area.

In context to this research study, the literature review had been used to demonstrate that information is available on EA with specific focus on the research problem and research questions, however very little attention had been previously given to EA measurement. The literature study initiated with EA in general outlining the value of EA to organisations, methodologies, architectures and organisational roles within EA thereafter it had focused on the types of EA frameworks. The next section was an overview of EA maturity and the key aspect of this research study being EA measurement, whereby details had been provided on EA measurement strategies.

The literature review was of importance to me as it had given gave me insight to the problems and challenges of EA and specifically the measurement of EA that has been reported.

6.4.2 Interviews and surveys

The research questions and sub-research questions have been answered more specifically through the use of interviews and surveys. In context to this research study, financial service organisations and retail organisations were the targeted within the South Africa, Western Cape. Looking back at the research process, it was disappointing that only a few organisations had responded to the survey. The approach to simply mail organisations the URL link to the survey was perhaps a problem as it seemed as if certain individuals prefer hard copies of the survey. It could also be that many organisations do not have time to respond to these research surveys as they seldom get feedback of the completed survey. The result of the low response rate pursued me to change my strategy from being surveys only to interviews as well.

As described by Babbie (2009) surveys are used to administer a group or a selection of individuals. Jansen (2010) explains surveys as an establishment of a meaningful variation within a specific area of study. This research study surveyed individuals who are interacting with the EA strategy/program.

The interviews were done as a semi-structured one-on-one interview process (Kvale & Brinkman 2009). Interviews provided a detail insight to first hand experiences of EA within organisations. The interviews were understandable and insightful which had caused me to acquire much more information than I had expected. Interviews were open and answered truthfully. I was expecting some reluctance but this was not the case. I made use of an interview guide and found it to be useful as it had assisted me to always reflect back to the research questions.

6.4.3 Research methodology

The research methodology is fundamental to any research study as it provides a guideline for the entire research study as well as the methods which the research would follow in order to answer the research questions. The research methodology for this research study was based upon the qualitative inductive approach. This had provided meaningful data from individuals who had interacted in this research study. The conclusions that were obtained from all aspects of data collection assisted in determining guidelines for enterprise architects as well as answering the research questions.

6.5 Recommended future research

EA is not fully matured and effective within organisations. With regards to future research, additional work can be done by exploring the measurement of EA within South African organisations. In this section I provide some suggestions for future work. The following may be considered:

- The given guidelines could be used and tested within an organisation before implementing an EA strategy.
- As a final area of research, the theoretical BSC/EA measurement scorecard provided, in this research study, could be tested and validated as a strategy/tool for measuring EA within an organisation in order to determine the benefits and value from the specific EA strategy.

With a growing demand in EA, these topics can be considered to assist EA in achieving its organisational goals, EA measurement and EA maturity.

6.6 Conclusion

This research study explored EA measurement as a methodology to add value to organisations. The research study focused on aspects revolving around EA and more specifically EA measurement. In conclusion, it seems as if EA measurement is still a major problem in many organisations as a result of complexities in the EA strategy which disallows organisations to determine the benefits and value of the EA strategy. The guidelines, for enterprise architects and organisations, which had been given, are based upon contributions from literature, interviews and surveys. The proposed guidelines and the theoretical BSC/EA measurement scorecard may assist in measuring the success and contribution of EA to an organisation, thus determine the benefits and value of EA. In conclusion, the BSC/EA measurement scorecard can be implemented to determine the level of the EA strategy as well as assessing the performance of an organisation.

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Appendices

Appendix A: Interview questions

Appendix A consists of the letter attached with the questionnaire which had been sent out to the various interviewees.

Cape Peninsula
University of Technology

Dear Respondent

As per our discussion via email, I have attached the questionnaire which would be used during the interview process. The questionnaire consists of 6 sections relating to enterprise architecture. Your assistance would be gladly appreciated. The questionnaire would take approximately 45minutes to complete.

All the information collected during this interview would be used for my research study investigating EA implementation and development, EA maturity as well as EA measurement. These results will then be used for research purposes only. All respondents' information and organisational information will remain anonymous.

Position in organisation: _____

Date (month and year): _____

Kind Regards

Masood Ruyter
Masters student CPUT
Mobile: 084 550 0629
Email: masoodr1@gmail.com

Section 1 – EA implementation

Question 1: Does your organisation make us of a formal enterprise architecture framework?

Question 1a: If "yes" answered to question 1, which specific enterprise architecture framework is being used?

Question 2: If there is an existing enterprise architecture framework, how long ago has it been implemented?

Question 3: Why are enterprise architects unable to realise the benefit s of enterprise architecture, once enterprise architecture has been initiated and implemented?

Section 2: EA growth and influential factors

Question 4: What are the possible in-house factors that may affect the implementation and development of enterprise architecture within a company?

Question 5: What are the external factors which could possibly affect the implementation and development of enterprise architecture within a company?

Question 6: From a financial perspective, what needs to be taken into consideration for the implementation and development of enterprise architecture within a company?

Question 7: How readily available are the enterprise architecture resources within the company?

Question 8: What were the company's organisational goals which had been set out for the enterprise architecture strategy?

Section 3: EA satisfaction

Question 9: What characteristics of enterprise architecture is the company most satisfied with?

Question 10: What characteristics of enterprise architecture are the organisations dissatisfied with?

Section 4: EA business case selection

Question 11: Once the business case had been developed for enterprise architecture, was any value metrics used to assist the business case?

Question 11a: If "yes" answered to question 12, what were the value metrics which had been used?

Section 5: EA maturity

Question 12: How could enterprise architecture maturity be defined in your company in terms of its

Question 13: When would you consider enterprise architecture to have reached its matured state?

Question 14: What could be regarded as critical success factors for achieving enterprise architecture maturity within the company?

Section 6: EA measurement

Question 15: Does your company have any plans of implementing a measurement strategy for enterprise architecture?

Question 15a: If "yes", what measurement strategy has been used?

Question 15b: If "no", why is there no measurement strategy within your company?

Question 16: With regards to enterprise architecture measurement, would you regard measurement to be beneficial?

Question 17: What would you like to achieve from the measuring enterprise architecture within your company?

Question 18: Would the balanced scorecard be a potential measurement tool for enterprise architecture?

_____

_____

_____

_____

----------THANK YOU----------

Appendix B: Survey Questions

Appendix B consists of the letter attached with the survey which had been sent out to the various respondents.

Cape Peninsula
University of Technology

Dear respondent

The online survey entails various questions relating to enterprise architecture. The questions are structured as open-ended, partial open-ended and close-ended questions. There are 3 sections to complete in this survey. Please ensure to complete the full survey as it would assist in the data gathering process for my research study. The survey would take approximately 20minutes to complete. Please follow the link to the survey:

http://www.esurveyspro.com/Survey.aspx?id=f1d1f162-ffbb-4ac0-a46b-cccc1a0a1da5

Thank you in advance for the assistance.

Kind Regards
Masood Ruyter
Masters student CPUT
Mobile: 084 550 0629
Email: masoodr1@gmail.com

Section 1 – EA implementation and the IT department

Question 1: How significant is the IT department and its success for the company?

- Very important
- Important
- Average
- Not important
- Uncertain

Question 2: How fundamental is business needs to the IT department?

- Very important
- Important
- Average
- Not important
- Uncertain

Question 3: How well does the company mitigate IT risks and assuring that IT is on its top performance?

- Good
- Average
- Bad

Question 4: Does your company make use of any formal enterprise architecture framework?

- Yes
- No

Question 5: If yes answered to question 4, which framework does your company make use of?

_____

_____

Question 6: How complex was the implementation process of enterprise architecture within the organisation?

- Complex
- Moderate
- Uncertain

Section 2 – EA maturity

Question 7: How acquainted are executive managers with the enterprise architecture strategy?

- Executive members are aware of the benefits which EA offers to an organisation
- Executive managers are unaware of the benefits which EA offers to an organisation
- If other, please specify

_____

_____

Question 8: In terms of enterprise architecture maturity, describe the current results of the EA strategy within the organisation?

- EA has provided no results thus far
- EA has proven some results to the organisation
- If other, please specify

_____

Section 3 – EA measurement

Question 9: Does your company have any plans of implementing a measurement strategy for enterprise architecture?

- Yes
- No
- Maybe

Question 10: With regards to enterprise architecture measurement, would you regard measurement to be beneficial?

_____

_____

Question 11: Would the balanced scorecard be a potential measurement tool for enterprise architecture?

- Yes
- No
- Maybe

----------THANK YOU----------

Appendix C: The BSC/EA measurement scorecard

As described in Chapter 5. Below is an example of the BSC/EA measurement scorecard with calculations.

		1	2	3	4	5	6	7	Weight	Total
IT management ensures that IT is used well, so that strategies could be dealt with technology supply as component										
1	IT understand the business strategies	1							7	7
2	IT has the infrastructure (hardware/software) to support the business needs							7	5	35
3	IT know s the critical business processes			3					5	15
4	IT understands the critical business processes					4			5	20
5	IT has the infrastructure (hardware/software) to support the business processes							7	6	42
									39	**61%**
IS reflects the business by its operations and what it does										
1	There is a comprehensive IS strategy		2						7	14
2	When asking information about the business (for example customers) all employees w ill get the same answ er from the IT			3					6	18
3	Employees trust the information received from IT		2						7	14
4	There is an accountable person for information	1							4	4
5	Management understands w hat data quality is					5			5	25

6	Management is committed to quality data				4				4	16
									39	**39%**
BP delivers useful things to the organisation and therefore sums up all the effort that goes into delivery of results										
1	All business processes are mapped					5			5	25
2	There is a system for every single process				4				5	20
3	All business processes are designed to contribute towards the company's goals and objectives					5			7	35
4	There are strategies in place for continues quality improvement of business processes						6		6	36
									40	**72%**
Benefits could generate a certain amount of net profit that could be shared among the various organisations / departments.										
1	There are IT strategies in place to generate benefits for the company							7	5	35
2	IT knows the benefits that they can offer the business				4				5	20
3	IT monitors the benefits they have to deliver to business			3					6	18
4	All business processes are geared towards obtaining the benefits				4				6	24
5	The systems that support the business processes is designed in such a way to support the creation of benefits				4				4	16
									36	**62%**

BS accommodates the potential benefits of IT and extending from an understanding of base technologies that are used.										
1	Business understands the potential benefits IT offers the business						5		4	20
2	Business understands the base technologies to their disposal						5		5	25
									32	**71%**
Each business has its own vision, goals and objectives.										
1	The vision goals and objectives are clearly communicated to IT	1							5	5
2	IT contributes towards the vision, goals and objectives of the business			3					4	12
3	IT has its own vision goals and objectives?			3					6	18
4	The vision , goals and objectives of IT supports and are in line with the overall business vision, goals and objectives		2						7	14
									31	**40%**
At implementation, IT determines what is required, how to achieve it, what is expected by the business (including change management).										
1	IT has a specific methodology to determine what is required for implementation	1							5	5
2	IT has specific methodologies to achieve their goals?								4	0
3	It knows what the business expects			3					6	18
4	IT has regular meetings with business to manage business expectations			3					7	21
5	Business prioritise IT projects		2						3	6

6	There is a change management culture in the organisation				4				4	16
7	There is a change management program in the organisation					5			6	30
8	IT is part of the change management program in the business							7	1	7
9	There is a communication program within IT on how and when to communicate to business					5			3	15
									30	**43%**
Implementation, delivery of systems are determined by strategy, bringing benefits.										
1	There is a company implementation process	1							4	4
2	There is a company IT delivery process	1							5	5
3	There is a IT strategy for IT implementation in place		2						3	6
4	There is a IT strategy for IT delivery in place			3					2	6
5	All implementation and delivery strategies and processes are beneficial towards the company's vision and goals			3					3	9
									24	**25%**
BP delivers an output to organisational stakeholders after the business activities took place.										
1	Organisational stakeholders benefit from the business processes							7	5	35
2	All business process delivers useful outputs							7	4	28
									31.5	**100%**

The negotiated benefits would be delivered by the deployed IT, whether through investment or less real outcomes.										
1	The desired benefits are as a result of the deployed IT systems					5			5	25
									35	**71%**
The business strategy directs the high level instructions as objectives expected by the key stakeholders.										
1	The business strategies are clear and easy to understand			3					6	18
2	The company goals and objectives are in line with the business strategies			3					3	9
									32	**43%**
Business vision and goals will become achievable because of aligned instructions.										
1	The business vision is clearly articulated to IT			3					3	9
2	The business goals are clearly articulated to IT			3					2	6
3	The instructions from business to IT is clear and easy to understand	1							5	5
4	The instructions from business to IT is aligned with the Business vision and goals	1							7	7
									30	**23%**

IT uses a method for the defined set of analysis activities and techniques to deliver It solutions in a manageable way.										
1	There is a method in the organisation to delivering IT solutions							7	3	21
2	IT solutions are delivered in time							7	2	14
3	IT solutions are delivered within budget					5			6	30
4	IT solutions deliver quality artifacts					5			6	30
									30	**80%**
The plans for the business and its developments hould be established with the demands for the aligned new systems.										
1	IT is always aligning systems to business plans and development		2						5	10
2	IT is always aligning systems to business strategies and needs		2						5	10
3	New systems are always aligned with business plans and goals	1							6	6
									37	**23%**
Analysis undertaken to determine in detail the business process at higher and lower levels of IT strategies.										
1	IT strategies are linked to business processes	1							3	3
2	Analysis are done in detail on business processes	1							2	2
3	IT understand the business processes	1							5	5
4	Every business process is linked to a system		2						4	8
									25	**18%**

Benefits in IT requiring corporate governance for managing the relations between shareholders & business performance.										
1	Business understand the need for IT governance			3					5	15
2	IT understand the need for IT governance								5	0
3	IT follows a governance protocol					5			7	35
4	IT understands the benefits that governance can offer the shareholders					5			6	30
5	Business understands the benefits that governance can offer the shareholders		2						6	12
									41	**45%**
Business changes and stakeholder impact are identified and analysed.										
1	IT identifies business changes when executing their mandate		2						4	8
2	IT drives business change		2						5	10
3	IT analyse business processes in order to evaluate the impact and risk of the proposed changes		2						4	8
4	Business communicates the changes IT proposes to the business processes						5		6	30
5	IT is involved in the change management processes						5		6	30
6	There is a change management strategy in place					4			2	8
									32	**50%**

IS does collection of activities that delivers output through Business and IT alignment.										
1	Business and IT alignment is important in order to deliver the required output					4			7	28
2	IT measures alignment betw een business and IT					4			7	28
3	IT collects all activities that delivers on the output for business and IT alignment	1							7	7
									49	**43%**
IT determines how applications will be delivered, how technology and resources will be required, used, monitored & managed.										
1	Business has no say over how applications are delivered				4				5	20
2	Business has no say over technology				4				5	20
3	Business has no say over resources in IT						5		5	25
4	Business has no say over how IT uses, monitor and/or manages its applications						5		5	25
									35	**64%**
The commitment of business management and involved staff need to be supported by strategic IT.										
1	Business management is committed to supporting the IT strategies		2						4	8
2	The employees of the organisation is committed to support IT strategies							7	5	35
3	The organisation as a w hole know s and understand IT strategies							7	6	42
									35	**81%**

The project activities and map benefits to the projects deliver the enabling changes.										
1	Project activities are mapped to the benefits of what the project must deliver						6		4	24
2	Project activities includes the change management process	1							5	5
									32	**46%**
Types of benefits are determined and how they will be measured.										
1	The benefits that business processes offer are determined		2						6	12
2	The benefits that business processes offer are measured		2						7	14
									46	**29%**
Project management produces business benefits that represent the fulfilment of strategy.										
1	Project management produces the required benefits					4			3	12
2	Project management is aligned with the strategies of IT					4			3	12
3	Project management is aligned with the business strategies						5		5	25
									26	**64%**

Organisations responsible for process management and business performance delivery.										
1	The organisation takes responsibility for business process management	1							4	4
2	IT takes responsibility for business process management		2						5	10
3	IT takes responsibility for business performance delivery	1							5	5
4	The organisation takes responsibility for business performance delivery					4			4	16
5	IT is involved in business strategic planning					4			7	28
6	IT is involved in the business budgetary process							7	7	49
									37	**50%**